Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Prepared for

The Boeing Company

and

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List of Abbreviations/Acronyms

Acronym/Abbreviation	Definition
12-inch Pipe	12-inch Property Line Storm Pipe
24-inch Pipe	24-inch Property Line Storm Pipe
Anchor QEA, LLC	Anchor QEA
bgs	Below ground surface
Boeing	The Boeing Company
CDF	Controlled density fill
CMP	Corrugated metal pipe
Jorgensen	Jorgensen Forge Corporation
Jorgensen Forge Property	Jorgensen Forge Corporation Property
KCIA	King County International Airport
LDW	Lower Duwamish Waterway
MLLW	Mean Lower Low Water
Order	Administrative Order on Consent
OSC	On-Scene Coordinator
PCB	Polychlorinated biphenyl
Pipes	12-inch and 24-inch Property Line Storm Pipes
Plant 2	Boeing Plant 2 Facility
PVC	Polyvinyl chloride
QC	Quality control
Report	Completion Report
SDMH	Storm drain manhole
SVOC	Semivolatile organic compound
TPH-D	Diesel-range total petroleum hydrocarbons
USEPA	U. S. Environmental Protection Agency

Certification

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

	20MAY11		5/25/11
Steven Tochko, P.E. Boeing Environment, Health and Safety Senior Remediation Manager	Date	Wayne Desberg Jorgensen Forge Corporation Director of Engineering, Maintenance and Environmental	Date

1.0 Introduction

This Completion Report (Report) documents the cleanout and sealing of the 12-inch and 24-inch Property Line Storm Pipes (collectively, the Pipes) located on the Jorgensen Forge Corporation (Jorgensen) Property at 8531 East Marginal Way South in Seattle, Washington (Jorgensen Forge Property; Figure 1). The work described in this Report was addressed in the U.S. Environmental Protection Agency (USEPA) Action Memorandum (September 30, 2010) and performed under an Administrative Order on Consent (Order) entered into by the USEPA, The Boeing Company (Boeing), and Jorgensen in December 2010. Although located on Jorgensen Property, the Pipes also historically drained a number of adjacent properties, as detailed further in this Report. Previous investigations documented the presence of elevated concentrations of polychlorinated biphenyls (PCBs) and metals in solids within the Pipes. The work performed under the Order was a source control action to eliminate the potential for ongoing discharge of PCBs from the Pipes to the Lower Duwamish Waterway (LDW). Details of this work are presented in the USEPA-approved work plan (and amendments).

The USEPA's written acceptance of this Report closes out Boeing's and Jorgensen's responsibilities under the Order for this phase of the work and confirms that the cleanout and sealing of the clay portions of the Pipes[1] is complete.

1.1 SITE BACKGROUND

Following early settlement and the re-configuration of the LDW in the early 1900s, a "drainage ditch" existed near the current property line separating the Boeing Plant 2 Facility (Plant 2) property and the Jorgensen Forge Property. Historical aerial photographs suggest that this drainage ditch was first used for agricultural drainage up until the 1930s when it was used to drain a portion of the newly-constructed airport to the east.

Aerial photographs indicate that the drainage ditch was absent by the mid 1940s, likely replaced by the installation of the Pipes, concurrent with the development of the southern end of Plant 2 and the northern end of the Jorgensen Forge Property.

Figure 2 shows the location of the Pipes and associated manholes and laterals. The description and use of each pipe is as follows:

- An inactive 12-inch Property Line Storm Pipe (12-inch Pipe) composed of clay and corrugated metal pipe (CMP) that once drained stormwater from a portion of the south side of Plant 2.
- A 24-inch Property Line Storm Pipe (24-inch Pipe) composed of clay and CMP that once drained an additional portion of the south side of Plant 2, a portion of King County International Airport (KCIA), and a portion of the historic Bethlehem Steel Facility located on the Jorgensen Forge Property. Up until the time that work was performed under this Order, this pipe was an active storm drain for the City of Tukwila, its sole use to drain a limited amount of road runoff from East Marginal Way South located adjacent to the southern portion of Plant 2.

[1] The pipe's true construction is clay, not concrete. Additionally, the 12-inch Pipe has formerly been referred to as a 15-inch concrete pipe in prior reports and utility maps; however, its true inside diameter is 12 inches.

1.2 ORDER SCOPE OF WORK

Oversight of the source control action was transferred from the Washington State Department of Ecology to the USEPA Office of Emergency Response in late 2010. USEPA issued the Order to Jorgensen and Boeing to clean out solids contained within the Pipes and seal the concrete (clay) sections of the Pipes. The Order specified compliance with the following objectives specific to the clay sections:

- Eliminate stormwater discharges from the Pipes to the LDW.
- Remove the solids and associated contamination from the Pipes.
- Clean, close, and seal the Pipes.

The Order limited work activities to the clay portion of these Pipes that exist from the eastern Jorgensen Forge Property line downgradient to approximately 100 feet from the discharge location into the LDW. If necessary, any action on the remaining CMP sections of the Pipes is anticipated to be addressed under a subsequent administrative mechanism.

1.3 RESPONSIBILITIES

The primary personnel and responsibilities of the parties involved in the Order include:

- Mike Sibley, USEPA Office of Emergency Response, Federal On-Scene Coordinator (OSC).
- Eric Lindeman, Ecology and Environment, Inc., USEPA contractor providing field oversight services for the cleaning and sealing activities, including responsibility for field approval of adequacy of cleaning/sealing activities.
- Nick Garson, Boeing Project Coordinator responsible for leading execution of the Order.
- Floyd|Snider, environmental consultant managing the field work on behalf of Boeing. Responsible for document retention, work plan preparation, project management, overseeing subcontractor performance of field activities and preparation of this Report.
- Wayne Desberg, Jorgensen Project Coordinator responsible for facility access and coordination with Boeing.
- Anchor QEA, LLC (Anchor QEA), environmental consultant providing project oversight on behalf of Jorgensen. Responsible for review of documents submitted to USEPA, collection of split samples, and overseeing field activities on behalf of Jorgensen.

1.4 REPORT ORGANIZATION

The remainder of this report is organized into the following sections:

- **Section 2.0 Summary of Work Performed:** Describes the approved work plan and work plan modifications, sample locations and sampling procedures, and methods used for cleaning and sealing the Pipes and associated lateral connections.
- **Section 3.0 Summary of Analytical Results:** Summarizes analytical results for all work activities, including results of surface water sampling, soil and groundwater

sampling, solids and debris sampling, and decontamination and waste characterization sampling.

- **Section 4.0 Data Quality Review:** Summarizes the quality assurance review of the analytical data collected under the Order.
- **Section 5.0 Cost Summary:** Provides a summary of the costs of the project.
- **Section 6.0 References:** Lists resources cited in this document.

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2.0 Work Performed

2.1 APPROVED WORK PLAN

To accomplish the stated objectives of the Order, a work plan was developed and approved by USEPA prior to initiation of the work (Floyd|Snider 2010). The major elements of the work plan included the following:

- Tidal study surface water sampling to record how water levels in manholes vary with the tidal stages of the LDW.
- Geoprobe investigation to collect soil and reconnaissance groundwater samples near and around the CMP section of the Pipes.
- Pre-cleanout video survey of the Pipes.
- Seal the upstream end of the 24-inch Pipe on the eastern portion of the Jorgensen Property to eliminate continued City of Tukwila runoff from entering the pipe.
- Seal the Pipes at their transition to CMP to prevent tidal waters from entering the Pipes.
- Sample the solids within the Pipes, manholes, and associated accessible laterals.
- Remove accumulated solids and clean the interior of the Pipes and associated laterals and manholes by jet cleaning.
- Post-cleaning video survey to document the effectiveness of the cleaning.
- Seal the Pipes, manholes, and laterals.
- Manage and dispose of generated wastes.

2.2 APPROVED WORK PLAN MODIFICATIONS

Several modifications to the work plan were approved by USEPA to address new information. These modifications primarily referred to the laterals along the 24-inch Pipe. The modifications were proposed to Mike Sibley, USEPA OSC, on February 9, 2011 and approved of via email on February 10, 2011. The modifications are summarized in the following sections. Figure 2 shows the locations of the approved modifications.

2.2.1 Modification #1: Former Bethlehem Steel 10-inch Lateral

The work plan proposed that this lateral be cleaned along its entire length and then sealed; however, Jorgensen provided new information to Boeing/USEPA on January 4, 2011 in a report titled *Historical 6-inch and 12-inch[2] Lateral Pipes Investigation Report* by Anchor QEA. The Anchor QEA report documents that in May 2010 Jorgensen excavated down and broke into the lateral in two places, completed a video survey, and collected samples of the material inside the lateral pipe. The pipe was then sealed at the downstream break point with concrete and the excavation was backfilled with controlled density fill (CDF; Anchor QEA 2011). Given that the lateral was already sealed, the approved modification was to conduct a video survey to

[3] This lateral has formerly been referred to as a 12-inch pipe; however, the true inside diameter is 10 inches.

document the 2010 Anchor QEA seal and clean the lateral from its entry to the 24-inch Pipe to the new seal.

2.2.2 Modification #2: Jorgensen Office Side Sewer Lateral

The Jorgensen Office lateral is located in close proximity to the Jorgensen office building. The work plan originally proposed that this lateral be uncovered and cleaned. The modification proposed that no work be completed in this area based on the review of the pre-cleanout video survey. It appeared that this lateral had been sealed within inches of where it enters the 24-inch Pipe with a factory cap. Since the lateral was discovered to be adequately sealed, USEPA approved no further action for this lateral.

2.2.3 Modification #3: Jorgensen Visitor Parking Area 4-inch Lateral

A previously unknown lateral was discovered during the pre-cleanout video survey. This lateral was found at the top center of the 24-inch Pipe under one of the visitor parking spaces in the northeast corner of the Jorgensen Forge Property. The nature of this lateral was not known since it was not shown on any existing utility drawings. The approved modification to the work plan was to excavate to approximately 6 feet, or until reaching the lateral, and trace it back to its point of origin; following which the lateral would be sampled, cleaned, and sealed.

2.3 TIDAL SURVEY AND SURFACE WATER SAMPLING

Prior to the cleanout work, a tidal survey was performed by placing pressure transducers in each manhole in the 24-inch Pipe west of East Marginal Way South.

A single pressure transducer was left in place for approximately 2 weeks (prior to any pipe cleanout activities) within each of the 5 manholes along the 24-inch Pipe. The data collection was conducted over a period that includes a high tide of at least 12 feet Mean Lower Low Water (MLLW). In addition to transducer placement in the manholes, a single transducer was placed in a stilling well installed in the LDW to measure the elevation of the LDW over the same 2-week period. The stilling well was a 2-inch polyvinyl chloride (PVC) pipe mounted alongside a nearby wooden piling located just riverward and downstream of the Pipes' discharge location.

All transducers installed in the manholes were lowered via Kevlar line from the top side and positioned to rest horizontally on the bottom of the 24-inch Pipe. Accumulated solids were present in each manhole, so the transducer was placed on top of these solids. The Kevlar line was attached to the manhole lid to facilitate removal. The elevation of each manhole rim and floor (the resting surface of the transducer) were determined by a professional surveyor. The transducer data are included in Appendix A. Survey elevation data are shown on Figure 2.

In addition, surface water samples were collected from each manhole location and analyzed for conventional water quality parameters. Surface water samples were collected with disposable polyethylene tubing and a peristaltic pump at each manhole location where a transducer was placed. Surface water analytical results are summarized in Section 3.1 and presented in Table 1.

2.4 CMP GEOPROBE INVESTIGATION

This investigation was completed using a track-mounted Geoprobe to collect subsurface soil and reconnaissance groundwater samples. Most of the borings were advanced along three

primary transects closest to the CMP portion of the Pipes, as shown on Figure 3. Coordinates of the boring locations are provided in Table 2. Three other borings were located to the south of the three primary transects. Per the work plan, fewer Geoprobe locations were located to the south due to lack of observed fill in the more northern transects.

Three composite soil samples were collected from each boring at depths targeting the midway point between the ground surface and the top of the CMP sections (approximately 3 to 5 feet below ground surface [bgs]); a point close to the base of the CMP sections (approximately 8 to 10 feet bgs); and a point approximately 2 feet below the field-determined fill/native soil interface, which varied depending on thickness of fill. At Stations T2B4 and T3B4 poor recovery due to soil type prevented sample collection from the 8 to 10 feet bgs interval. In these locations, samples were collected from the next deeper interval with adequate recovery (18 to 20 feet bgs and 13 to15 feet bgs, respectively).

Soil cores and samples were described and classified according to the Unified Soil Classification System (USCS), photographed, and logged. The presence of fill debris, sheen, odor, and other indications of contamination were also noted. Boring logs and representative photographs are included in Appendices B and C, respectively. Soil analytical results are summarized in Section 3.2 and presented in Tables 3, 4, and 5.

Reconnaissance groundwater samples were also collected via Geoprobe using a temporary screen pushed into the upper 5 to 10 feet of the water table (approximately 15 to 20 feet bgs with the exception of location T3B4, which was collected at 24 feet bgs). Per the work plan, samples from the three southernmost borings were not analyzed due to the lack of observed fill in this area.

A work plan deviation occurred with regard to the field filtering procedure for reconnaissance groundwater samples. Instead of being field-filtered as specified in the work plan, the reconnaissance groundwater grab samples for PCB analysis were lab-filtered instead, using a 1 micron glass filter. USEPA was notified of the field change by email on January 14, 2011. Groundwater analytical results are summarized in Section 3.3 and presented in Table 6.

2.4.1 Observed Geological Conditions

Two major soil types were observed in the soil samples: fill material and underlying native soil. In addition, there were two types of fill material observed: a sandy gravel fill and a debris-rich fill that contained anthropogenic material such as glass, shell fragments, brick, and wood debris. The debris fill was encountered primarily in the borings (B3 and B4 series) of Transects 2 and 3 (Figure 3). Petroleum odor and/or sheen were also noted in some depth intervals of Borings T2B4 and T3B4 as well as in Borings T1B3, T2B1, and T3B1. Debris fill generally increased in depth towards the riverbank edge and the contact with native soils was observed up to 24 feet bgs in Borings T2B4 and T3B4. In the remaining borings, the contact with the underlying native soils (consisting of silt and fine sand) was encountered between 8 and 18 feet bgs.

2.5 PRE-CLEANING VIDEO INSPECTION

Prior to cleaning, a video inspection was conducted in the Pipes and accessible laterals by Bravo Environmental. Representative screenshot photos of the Pipes during the video inspections are provided in Appendix C. The inspection videos were recorded onto DVDs, copies of which are provided in Appendix D.

The pre-cleanout video inspection of the 24-inch Pipe was performed January 25 and 26, 2011 from the Public storm drain manhole (SDMH) to the CMP transition (Figure 2). The video inspection of the 12-inch Pipe was attempted January 26, 2011; however the camera was not able to traverse over the solids material in the pipe. A smaller camera was used February 18, 2011 to inspect the 12-inch Pipe from SDMH 15B to SDMH 15A. This effort was only partially successful due to standing water in the pipe. Therefore, pre-cleaning video was not obtained downgradient of SDMH 15A.

Other observations were noted as follows:

- As previously described, a factory cap seal was confirmed to be intact at the entry point of the lateral into the 24-inch Pipe near the Jorgensen office. No evidence of liquid or solid material was observed around the cap.
- The seal at the end of the 15-inch Boeing lateral entering SDMH 37-7 was observed approximately 100 feet upgradient on Plant 2 property at Boeing SDMH 37-10, consistent with previous documentation. A solid cement-like material was observed plugging the lateral at its termination point. A visual inspection of the seal was conducted from within SDMH 37-10 and the upgradient side of the seal was confirmed to be intact.
- The Jorgensen 10-inch Lateral to the 24-inch Pipe just upgradient of SDMH 24A was inspected on February 16, 2011 by a technician (using confined space protocol) entering SDMH 24A and hand-placing a small camera into the lateral. The video confirmed the presence of a piece of dimensional lumber lodged at the bend in the lateral before the lateral transitioned to a horizontal run. The location of the lumber had been previously reported to be approximately 40 feet upgradient from the connection with the 24-inch Pipe (Floyd|Snider and Weston Solutions 2005); however, the location recorded on the present video is approximately 20 feet from the 24-inch Pipe connection. The camera was not able to traverse past the lumber, so the lumber was dislodged by jetting and fell to the bottom of the 24-inch Pipe (refer to Section 2.6.2 for a detailed description of jetting activities). After the lumber was dislodged from the lateral, a camera was able to advance to the bend in the pipe where the lumber had been lodged. The camera was not able to travel beyond the bend, but the remaining section of the pipe up to the seal placed by Anchor QEA in 2010 was in view. The seal appeared to be intact and no evidence of recent liquid or solid material movement was observed around the seal. No other seals or penetrations into the lateral were observed. No video inspection was conducted upgradient from the seal.
- As previously described, a new lateral was discovered in the location of the Jorgensen northeast visitor parking area. The lateral is a 4-inch cast iron pipe that entered the top of the 24-inch Pipe. The lateral was observed to be plugged with soil. A video inspection of the 4-inch lateral was conducted again on February 14, 2011 after the upgradient portion of the pipe had been excavated from the parking area and jetted to remove soil that fell into the lateral upon excavation. The additional inspection revealed that the lateral rose up and made an immediate bend to the south several inches above its point of connection in the 24-inch Pipe and then went vertical terminating approximately 12 inches bgs.

2.6 MANHOLE AND LATERAL PIPE SAMPLING

2.6.1 Manholes along 12-inch and 24-inch Pipes

A discrete sample of the solids lying in the base of each manhole was collected prior to cleaning. The samples were collected on January 24, 2011. An extension pole with attached stainless steel scoop was used to collect each sample from the surface. The samples were homogenized in a stainless steel bowl prior to placement into sample jars. Each manhole is shown on Figure 4 and a description of each sample is provided in Table 7. The analytical data are discussed in Section 3.4 and presented in Figure 4 and Table 8. Photos are included in Appendix C.

2.6.2 Lumber from Jorgensen 10-inch Lateral

During the inspection of the Jorgensen 10-inch Lateral on February 16, 2011, the dimensional lumber was dislodged intact from the lateral, as described in Section 2.5. After it was dislodged, the lumber fell intact into a previously jetted section of the 24-inch Pipe. Later that day after being dislodged, the lumber was relocated by the video technician onto the top of the channelized section of the 24-inch Pipe within SDMH 24A (refer to Photo 24 in Appendix C). The video technician retrieved the lumber from SDMH 24A on February 18, 2011, 2 days after being dislodged. The damp lumber was placed into an unused plastic garbage bag, the top of the bag was folded over several times, but not sealed or otherwise secured, and the bagged lumber was placed on the outer frame of a solid waste bin to avoid contact with accumulated stormwater in the containment berm.

Because the dislodgement and recovery of the lumber was not expected, the ability to sample the lumber itself was unanticipated and not addressed in the work plan. Wood sampling was delayed several days to allow coordination between Boeing and Jorgensen. Prior to sampling, the contractor's cleaning technician placed the bagged lumber into the easternmost solid waste bin containing the wash water and solids prior to the morning of February 24, 2011. On February 25 2011, the cleaning technician retrieved the lumber from the corner of the solid waste bin, removed it from the original bag, and placed it in a new unused plastic bag. Following the removal from the bin, the damp lumber was sampled using a utility knife by scraping the surface to a depth of approximately ¼ inch. The damp scrapings were collected in a decontaminated stainless steel bowl, composited, and transferred directly into an 8-ounce glass jar. The lumber and sampling tools were discarded in the solid waste bin. The analytical data for the lumber sample (JF-PLSD-WD-12) are presented on Figure 5 and Table 9. Representative photographs of the lumber sampling are included in Appendix C.

2.6.3 Jorgensen Visitor Parking Area 4-inch Lateral

As described in Section 2.5, no solids were available for sampling within the Jorgensen Visitor Parking Area 4-inch Lateral so two alternative media samples were collected from the lateral on February 28, 2011. The first sample (JF-PLSD-WP-4L) was a wipe sample collected by using a lab-supplied hexane wipe. This was the only wipe sample taken of the pipe system. An estimated 2-inch-square area of the lateral wall from the top of the pipe to approximately 3 inches below the top of the lateral was wiped. The results of the wipe sample are presented in Table 9. The second sample was collected by lowering a small funnel approximately 4 feet into the lateral, scraping the inside walls of the lateral with a steel bar, and collecting the fallen scrapings captured by the funnel. The small amount of scrapings collected was less than the minimum sample volume; therefore, the sample (JF-PLSD-PS-4L) was not able to be analyzed.

2.7 UPSTREAM AND DOWNSTREAM SEALING

Prior to cleaning the Pipes, the downstream ends of the Pipes were sealed to prevent influx of tidal waters. In addition, the active, upstream end of the 24-inch Pipe was sealed off. These actions are described below.

2.7.1 Public Manhole

The upstream end of the 24-inch Pipe within the Public SDMH was sealed under permit from the City of Tukwila (Appendix E). Once sealed, the stormwater runoff from East Marginal Way South, which originally flowed down the pipe and discharged into the LDW, would back up within the next upgradient manhole and flow out of an overflow pipe located in the middle of East Marginal Way South and discharge to the south. The pipe was sealed by placing an inflatable buoy into the 24-inch Pipe as a backer and drilling several bolts into the walls of the pipe for concrete reinforcement. Quick-setting concrete was packed against the buoy and around the bolts until flush with the side of the manhole. A piece of plywood was wedged flush against the seal and wall of the manhole to prevent the concrete from sloughing out.

Representative photographs of the Public SDMH seal are included in Appendix C.

2.7.2 Seals Placed at CMP Transition

To prevent influx of tidal waters from entering the clay sections of the Pipes, seals were placed at the transition point between the CMP and clay sections of each pipe (Figure 2). This was done by excavating with a trench box atop the transition point. The excavated soil was stockpiled for backfill. Once the transition of each pipe was uncovered, a short section of clay pipe, approximately 3 feet long, was removed at the joint closest to the CMP. An inflatable buoy was placed into the open CMP stub and secured to an iron beam that was found lying perpendicular to the Pipes above the transition point. Several bolts were drilled into the stub for concrete reinforcement and quick-setting concrete was packed into the opening until flush with the stub.

On the open end of each clay pipe, a 12-inch PVC riser pipe was installed to facilitate the cleaning activities. To attach a riser to the 24-inch Pipe, a 90-degree elbow was first secured to the pipe with concrete, and for the 12-inch Pipe, an elbow was secured using a compression collar. A vertical standpipe approximately 10 feet long was fit to each elbow. When the downgradient seal and riser were in place, the excavation was backfilled with approximately 3 feet of CDF and the stockpiled excavated soil was replaced in similar sequence as it was removed (i.e., "first out, last in").

At the conclusion of cleaning and sealing of the Pipes, the cleanout risers were sealed. This was done by excavating a small area around the cleanouts to approximately 3 feet bgs. The standpipe of each cleanout was cut to approximately 2 feet bgs. A small buoy was placed approximately 10 inches into each standpipe and quick-stetting concrete was packed to the top. The plastic caps were reinstalled onto each standpipe and the excavated material was backfilled and compacted to match the existing grade.

Representative photographs of the transition sealing are included in Appendix C.

2.8 PIPE AND LATERAL CLEANING

Once the upstream and downstream ends of the clay pipes were sealed, pipe cleaning commenced. Cleaning was completed by Bravo Environmental under supervision of Floyd|Snider. Cleaning began February 7, 2011 and was completed February 18, 2011. A water jetting process, using recycled wash waters, was used to accomplish the cleaning.

2.8.1 Wash Water

A temporary water treatment and storage area was constructed in the southwest corner of the Jorgensen Forge Property to treat wash water generated during the cleaning phase of the project by removing particulates so that it could be reused for cleaning purposes.

In general, water was treated by decanting the vacuum truck into a solid waste bin to allow initial filtering of solids. The water was then pumped from the bin, through tubing treated with chitosan flocculating agent, and into a 10,000-gallon Baker Tank to allow settling. The water was then pumped from the top of the settling tank, through a sand filter and into one of three 18,000-gallon Baker Tanks. Flocculation and sand filtering lowered the turbidity to 30 nephelometric turbidity units or less, allowing the water to be re-used for jet cleaning. The treated water was re-used as wash water for cleaning the Pipes, the Jorgensen Visitor Parking Area 4-inch Lateral, and the Jorgensen 10-inch Lateral, and eventually treated again multiple times to save use of potable water and to facilitate off-site disposal of the water following completion of the work plan activities.

Approximately 4,000 gallons of potable water initially drawn from a hydrant on the Jorgensen Forge Property was used for the initial cleaning of the most upgradient section of the 24-inch Pipe from SDMH 37-2 to Public SDMH II. After it was recovered by vacuum truck, it was processed through the treatment system and continually reused for jetting. A total of 21,000 gallons of water were used for jetting, resulting in an estimated savings of 17,000 gallons of potable water.

In total, 37,000 gallons of water was treated. The majority of this total, an estimated 32,000 gallons, originated from groundwater that infiltrated into the pipes that was removed as part of the pipe and laterals cleaning process. The remainder was recycled potable water, including 4,000 gallons originally drawn from the Jorgensen hydrant and an additional 1,000 gallons used for decontamination purposes.

A sample of water stored in each of the three Baker Tanks and a sample collected from the jetting truck tank itself during the cleaning process were characterized. The total PCB concentration of each sample is given below. Complete waste characterization analytical results of these samples are provided in the lab reports in Appendix F.

Wash Water Total PCBs Analytical Results (µg/L)

Sample Location	Jetting Truck	Baker Tank (08)	Baker Tank (59)	Baker Tank (89)
Sample ID	JF-PLSD-RJW-4L	JF-PLSD-WC-B08	JF-PLSD-WC-B59	JF-PLSD-WC-B89
Sample Date	2/15/2011	2/25/2011	2/25/2011	2/25/2011
Total PCBs	3.5	5.5	3.2	2.1

2.8.2 12-inch and 24-inch Pipes

The Pipes were cleaned by a self-propelled jetting hose. To clean most sections of the Pipes, the jetting nozzle was deployed through a manhole downstream of the targeted section and allowed to self-propel upstream through the pipe. Then solids and wash water were moved downstream. For the final downstream section of each pipe, the jetting nozzle was directed downstream to the plug at the CMP transition and material was forced upstream to the nearest manhole.

Once the jetting nozzle was deployed into the targeted pipe section, the water pressure was increased to maximize washing and material moving power, and the hose was retrieved while simultaneously vacuuming the wash water and solids from a manhole into a 3,000-gallon vacuum truck. Typically two types of nozzles were used. First, a jetting nozzle with multiple jets positioned in a circular pattern within an oval steel cage, designed to spin while staying centered in the pipe, was deployed to remove solids from the top and side walls. Next, a nozzle with jets affixed to a heavy sled, designed to keep the nozzle close to the bottom of the Pipes, was deployed to plow the freed material down the section while scrubbing the bottom surface of the pipe. Both nozzles were passed several times through each section of the Pipes.

Once a section was complete, a temporary, inflatable plug was installed to isolate the section while the adjacent downstream section was cleaned. Each manhole interior was then cleaned by pressure washing from the surface and vacuuming before moving to the next manhole.

2.8.3 Jorgensen 10-inch Lateral

The Jorgensen 10-inch Lateral was cleaned by entering Manhole SDMH 24A and hand-placing the jetting nozzle into the lateral. The first jetting pass was able to free the lumber that had lodged in a bend in the pipe (refer to Section 2.6.2). The remaining solid material was washed from the lateral into the adjoining 24-inch Pipe and vacuumed from Manhole SDMH 24A. After the lateral was cleaned, the short segment of the 24-inch Pipe between the lateral and manhole was re-cleaned (Figure 2). A temporary plug was installed in the 24-inch Pipe downgradient from the lateral to isolate it while the manhole and the remaining downgradient sections of the 24-inch Pipe were cleaned.

2.8.4 Boeing 15-inch Lateral

The Boeing 15-inch Lateral into the 24-inch Pipe was cleaned by passing the jetting nozzle through the tee connection with SDMH 37-7 and feeding it into the lateral. The lateral was cleaned by several passes of the jet from the seal to the tee connection. Material was power washed and vacuumed from both the tee connection and the manhole.

2.8.5 Jorgensen Visitor Parking Area 4-inch Lateral

The Jorgensen Visitor Parking Area 4-inch Lateral was first exposed by hydrovacuuming, which used high pressure to loosen soil followed by vacuuming to remove the soil. Once exposed, the 4-inch lateral was found to extend vertically to an elevation just below the ground surface where it appeared to have been broken off (jagged edge on end of lateral). No cap or seal was present on the upgradient end. The 4-inch lateral was then cleaned by feeding the power washer nozzle into the top (upgradient) of the exposed lateral and flushed with recycled wash water (refer to Section 2.8.1). The amount of solid material flushed from the lateral is assumed to be very small and consisted of a small plug of soil where the pipe was broken off just under the surface and a

small amount of material, visible in the pre-cleaning video survey, at the connection point with the 24-inch Pipe. Because the 4-inch lateral was cleaned after the Public SDMH and SDMH 37-2 had been sealed, the 24-inch Pipe could not be accessed to remove the material or liquids accumulated; however, due to the limited quantity and the fact that the 24-inch Pipe was clean and sealed, the USEPA representative on-site approved leaving this minor amount of wash water behind.

2.9 POST-CLEANING VIDEO INSPECTION

After a section of the Pipes was cleaned, it was inspected by video camera in a similar fashion to the pre-cleaning inspection. Representative screenshot photos are provided in Appendix C. Copies of the post-cleaning inspection videos are provided on DVDs in Appendix D.

The video of each cleaned pipe segment or lateral was reviewed by the on-site USEPA contractor. If necessary, a pipe segment or lateral was re-jetted and re-videoed. Once clean, the pipe segment or lateral was isolated by installing either temporary inflatable plugs or by the permanent manhole seals prior to jetting an adjacent segment.

2.10 MANHOLE SEALING

Following cleaning of the pipes, the manholes were sealed in accordance with the work plan. Location of the seals is noted on Figure 2. The method used to seal each location is described below. Photographs are also provided in Appendix C.

- Manholes SDMH 24A, 24B, 37-2, and 37-7 in the 24-inch Pipe (Figure 2) were sealed by placing inflatable buoys in the pipe on both sides of the manhole and, at SDMH 37-7, into the opening to the adjoining tee connection with the Boeing 15-inch Lateral. The buoys were anchored to the ladder within the manhole and to each other to hold them in place. Each manhole was filled with CDF to the surface and the existing manhole cover was reinstalled.
- The Jorgensen Visitor Parking Area 4-inch Lateral was sealed by packing absorbent pads into the lateral to approximately 1.5 feet bgs and packing CDF in the remaining few inches of the lateral to approximately 6 inches bgs. The hole was then filled with hot patch asphalt to the existing parking lot level.
- Manhole SDMH 15B was sealed by placing a buoy on either side, tying them together, and filling the manhole with CDF. The remaining stub of the 12-inch Pipe angling onto the Boeing property is approximately 10 feet long and sealed. The seal was confirmed to be intact during the video inspection.
- Manhole SDMH 15A was sealed by placing inflatable buoys in the 12-inch Pipe on both sides of the manhole and securing them to each other. The manhole was filled with CDF to the surface and the existing manhole cover was reinstalled.
- The downstream end of the Public SDMH was sealed by an inflatable buoy placed into the 24-inch Pipe. The manhole was then filled to the surface with CDF. In the process, two additional small input lines that once drained to the manhole were also plugged. These lines had been previously decommissioned by the City of Tukwila. A flapper valve was removed from one of the lines and was allowed to fill with CDF. Absorbent pads were placed into the other line to plug it. The manhole cover was then reinstalled.

2.11 WATER AND SOLIDS COLLECTION TREATMENT AND DISPOSAL

The wastes generated over the course of the project were contained, temporarily stored, and treated and discharged (water) or disposed of (solids) in accordance with applicable regulations. Wastes were primarily handled on the Jorgensen Forge Property with a temporary water treatment and storage system and solid waste roll-off bins. Photographs of the waste handling system are provided in Appendix C.

2.11.1 Water

As described in Section 2.8, a temporary water treatment and storage area was constructed in the southwest corner of the Jorgensen Forge Property to treat water generated during the cleaning phase of the project. Waste waters included: wash waters from pipe jetting, infiltrated groundwater removed from the Pipes to facilitate cleaning, stormwater accumulated in containment berms, water removed from solid waste bins, and equipment decontamination water. Wash water and infiltrated groundwater accounted for the majority of the water volume.

Under approval from King County Industrial Waste (Rice 2011), the water was transported by tanker truck to the dedicated, permitted treatment system at North Boeing Field. The water was discharged to this treatment system where it was flocculated again, carbon filtered, and discharged to the sanitary sewer. Approximately 37,000 gallons of water were transported, treated, and discharged.

2.11.2 Solids

Solid waste collected during the pipe cleaning phase of work (including material removed from the pipes, disposable equipment and safety gear, disposable components of the water treatment system, decontamination waste, etc.) was stored in three roll-off bins on the Jorgensen Forge Property. The bins were dewatered and the removed water was processed through the on-site system described above. In addition to the bins, two 55-gallon drums of solid waste and soil cuttings from the CMP Geoprobe borings, and one drum of water and three drums of solid waste debris from decontaminating the camera equipment used during the pre-cleaning video survey were stored on Plant 2.

The solid waste was characterized by collecting samples of the waste (Appendix F) and by review of the recently collected CMP investigation soil and groundwater samples (Tables 5 through 8). A total of approximately 45 cubic yards of solids and debris were shipped to a licensed disposal facility in Arlington, Oregon in coordination with Oregon Department of Environmental Quality. Waste disposal documentation and copies of the waste manifests are provided in Appendix G.

2.11.3 Decontamination of Equipment

Non-disposable equipment used throughout the course of the project was decontaminated in accordance with the work plan. Fresh water, not recycled water, was used for decontamination. CAPSUR solvent was used to decontaminate equipment exposed to solids or liquids inside the pipes, including the camera equipment, jetting hose and reel, vacuum truck barrel, and the water treatment system tanks and sand filter. Fresh water flushing and wiping was used for other support equipment such as the camera van or for equipment that may have been damaged by solvent such as the water pumps. Decontamination was verified by use of a black light to ensure adequate coverage and subsequent removal of the CAPSUR or by collection of

wipe samples. Analytical results of the wipe samples are included in the laboratory reports provided in Appendix F.

A lined and bermed containment system was in place surrounding the perimeter of the flocculation tank to capture any potential spills or leaks prior to contacting the underlying soil. The containment system also captured stormwater from rainfall that occurred during the project. The accumulated stormwater was regularly pumped out into the treatment system. An approximately 1 foot by 1 foot "L"-shaped tear in the bermed containment system liner was noted on March 2, 2011. Field personnel identified that stormwater migrated through the tear into the underlying soils. The amount of stormwater released to the underlying soil was not determined. The tear was repaired on March 3, 2011, the day following identification of the tear. Water was sampled from within the containment area and contained 1 µg/L total PCBs. No further action was taken.

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3.0 Summary of Analytical Results

The following sections describe the analyses performed on the samples collected during the source control action. All analyses were performed by Analytical Resources, Inc. The laboratory analytical reports are included as Appendix F.

3.1 TIDAL SURVEY SURFACE WATER ANALYTICAL RESULTS

Surface water samples collected as part of the tidal survey were analyzed for the following parameters, as specified in the work plan:

- Alkalinity by USEPA 310.1-SM2320
- Anions by USEPA 300.0
- Cations by USEPA 6010B
- pH by USEPA 305.1-SM2310
- Salinity by USEPA 120.1

The analytical results are presented in Table 1.

3.2 CMP SUBSURFACE SOIL INVESTIGATION ANALYTICAL RESULTS

Soil samples collected from boring locations were analyzed for the following parameters as specified in the work plan:

- PCBs by USEPA Method 8082
- Diesel-range total petroleum hydrocarbons (TPH-D) by NWTPH-Dx
- Semivolatile organic compounds (SVOCs) by USEPA 8270D
- Metals (arsenic, cadmium, copper, lead, nickel, zinc) by USEPA 6010B

The Geoprobe soil analytical results are included in Tables 3, 4, and 5.

3.3 CMP GROUNDWATER INVESTIGATION ANALYTICAL RESULTS

Groundwater samples collected from boring locations were analyzed for the following parameters, as specified in the work plan:

- PCBs by USEPA Method 8082 (low-level)
- Volatile organic compounds by USEPA 8260C

The groundwater analytical results are presented in Table 6.

3.4 MANHOLE SOLIDS SAMPLING ANALYTICAL RESULTS

Solid samples collected from the manholes were analyzed for the following parameters, as specified in the work plan:

- PCBs by USEPA Method 8082

- TPH-D by NWTPH-Dx
- SVOCs by USEPA 8270D
- Metals (arsenic, cadmium, copper, lead, nickel, zinc) by USEPA 6010B

The data are presented in Table 8. Additionally, Figure 4 shows the results of the PCB analysis.

3.5 LATERAL LINE SAMPLING ANALYTICAL RESULTS

Samples collected from the lateral lines were analyzed for the following parameters.

- PCBs by USEPA Method 8082

The analytical results are presented in Table 9. Additionally, Figure 5 shows the results of the PCB analysis.

4.0 Data Quality Review

The sampling and analysis performed conformed to USEPA direction, approval, and guidance regarding sampling, quality assurance/quality control (QA/QC), data validation, and chain-of-custody procedures. The following paragraphs provide further detail on data quality.

4.1 FIELD QUALITY CONTROL SAMPLE COLLECTION

In accordance with the work plan, field quality control samples were collected at the frequency required including field rinsate blanks, trip blanks, and duplicate samples. The analytical results for each field quality control sample are reported in the tables discussed in Section 3.0.

4.2 DATA QUALITY REVIEW AND VALIDATION

Per the work plan, a data quality review and validation were performed on the analytical data. Two types of data quality review were performed. A basic "Level I" summary validation was performed on the surface water and solids samples (collected in the Pipes) and a more detailed "Level III" validation was performed on the soil and groundwater samples (collected during the Geoprobe investigation). The data quality review was performed by a qualified independent contractor in accordance with methodology identified in the work plan. Three summary memoranda were produced by the validation contractor describing the details of the data quality review. Each memorandum was reviewed and approved by Floyd|Snider's Quality Assurance Manager. Copies of the data validation memoranda are included in Appendix H.

Overall, the data were judged to be acceptable for use and met the data quality objectives of the work plan. Holding times were met, field and laboratory QC limits were met, except for minor exceptions, which are described in detail in the data validation memoranda in Appendix H. Method blanks, trip blanks, and rinsate samples were either free of contaminants or the concentrations were not high enough to result in qualification of or rejection of data. In certain instances, primarily related to slight exceedances of QC limits for relative percent difference and surrogate recoveries, the data validation contractor added data qualifiers to modify the usefulness of individual sample results. Typically, these resulted in the laboratory reported values being converted to an estimated value ("J" flagged). These added data qualifiers are reported on the analytical data tables discussed in Section 3.0.

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5.0 Cost Summary

5.1 COSTS

The following is a summary of the costs incurred as part of completion of the Order by Boeing and Jorgensen from December 2010 to April 2011. These costs are inclusive of subconsultant fees, media (Geoprobe, reconnaissance groundwater, property line storm pipe solids, 4-inch lateral wipe, and 12-inch lateral lumber) sampling and split sampling, tidal elevation survey, soil excavation and replacement, cleaning/sealing/video contractors, laboratory coordination, analytical fees, driller/utility clearance, solids disposal, database activities, financial assurances, and regular communications between Boeing and Jorgensen team members.

Approximate Boeing-incurred Costs	$380,000
Approximate Jorgensen-incurred Costs	$160,000
USEPA-incurred Costs	Not available at the time of this report

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6.0 References

Anchor QEA, LLC (Anchor QEA). 2011. *Historical 6-inch and 12-inch Lateral Pipes Investigation Report.* 4 January.

Floyd|Snider. 2010. *Jorgensen Forge Outfall Site Source Control Action 15-inch and 24-inch Pipes Cleanout Work Plan.* Prepared for The Boeing Company. 17 December.

Floyd|Snider and Weston Solutions. 2005. *Phase 2 Transformer PCB Investigation Report.* Prepared for The Boeing Company. 3 August.

Rice, P. 2011. Email message "RE: Plant2/Jorgensen Steel Storm Line Cleaning Water" to Doris S. Turner, The Boeing Company. 17 March.

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Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Tables

Table 1
CMP Investigation Surface Water Analytical Results—Detected Compounds[1]

	Location	Public-SDMH-II	Public-SDMH-II	SDMH 24A	SDMH 24B	SDMH 37-2	SDMH 37-7	LDW-Stilling Well
	Sample ID	JF-PLSD-SW-Public	JF-PLSD-SW-Public-D[2]	JF-PLSD-SW-24A	JF-PLSD-SW-24B	JF-PLSD-SW-37-2	JF-PLSD-SW-37-7	LDW-Stilling Well
	Sample Date	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	12/22/2010	01/06/2011
Parameter	**Units**							
Conventionals								
Alkalinity	mg/L CaCO3	39.2	38.8	37.8	38.2	32.4	38.9	55.2
Bicarbonate	mg/L CaCO3	39.2	38.8	37.8	38.2	32.4	38.9	55.2
Carbonate	mg/L CaCO3	1 U	1 U	1 U	1 U	1 U	1	1 U
Hydroxide	mg/L CaCO3	1 U	1 U	1 U	1 U	1 U	1	1 U
Chloride	mg/L	519	529	311	477	441	490	2510
Sulfate	mg/L	64.9	67.8	40.4	60	54.5	62.5	363
Conductivity	umhos/cm	1700	1750	1130	1590	1490	1630	7400
Salinity	ppt	0.9	0.9	0.6	0.8	0.7	0.8	4
pH	std units	6.85	6.74	6.81	6.78	6.96	6.88	6.73
Metals								
Magnesium	mg/L	32.3	34.2	21.8	31.1	28.4	31.1	163
Organometallics								
Calcium	mg/L	19.6	20.9	15.4	18.2	17.2	18.1	62.5
Potassium	mg/L	11	11.7	7.5	10.4	9.6	10.6	53.4
Sodium	mg/L	272	291	176	256	233	259	1460

Notes:

1 Data qualifiers assigned independently by Informa LLC.
2 Duplicate sample.

Abbreviations:

CaCO3 Calcium carbonate
mg/L Milligram per liter
mS/cm Micromho per centimeter (siemen)
ppt parts per trillion
std units Standard units

Qualifier:

U Not detected

Table 2

CMP Investigation Geoprobe Boring Location Coordinates[1]

Location	Easting	Northing
T1B1	1,275,874.8	195,811.3
T1B2	1,275,856.4	195,811.2
T1B3	1,275,808.3	195,811.1
T1B4	1,275,763.2	195,819.1
T2B1	1,275,886.8	195,796.5
T2B2	1,275,856.3	195,797.9
T2B3	1,275,824.9	195,798.6
T2B4	1,275,795.3	195,799.5
T3B1	1,275,888.6	195,770.3
T3B2	1,275,859.1	195,771.6
T3B3	1,275,827.1	195,770.7
T3B4	1,275,805.8	195,771.2
T4B2	1,275,858.1	195,745.2
T4B3	1,275,828.2	195,755.6
T5B3	1,275,855.9	195,715.3

Note:

1 Locations presented in State Plane Coordinate System, Washington North Zone, Units of Survey Feet, relative to NAD83 Horizontal Datum.

Abbreviation:

CMP Corrugated metal pipe

Table 3
CMP Investigation Geoprobe Soil Analytical Results—Detected Compounds
Transect 1[1]

Location		T1B1	T1B1	T1B1	T1B2	T1B2	T1B2	T1B2	T1B3	T1B3	T1B3	T1B4	T1B4	T1B4
Sample ID		JF-T1B1-SO-03	JF-T1B1-SO-08	JF-T1B1-SO-13	JF-T1B2-SO-03	JF-T1B2-SO-03-D[2]	JF-T1B2-SO-08	JF-T1B2-SO-13	JF-T1B3-SO-03	JF-T1B3-SO-08	JF-T1B3-SO-18	JF-T1B4-SO-03	JF-T1B4-SO-12	JF-T1B4-SO-18
Sample Date		01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011	01/14/2011
Sample Depth (ft bgs)		3–5 ft	8–10 ft	13–15 ft	3–5 ft	3–5 ft	8–10 ft	13–15 ft	3–5 ft	8–10 ft	18–20 ft	3–5 ft	12–14 ft	18–20 ft
Parameter	**Units**													
Metals														
Arsenic	mg/kg	7	7 U	7 U	6 U	6 U	6 U	7 U	5 U	6	12	120 U	6 U	6 U
Cadmium	mg/kg	0.4	0.3 U	0.3	0.2 U	0.2 U	0.2 U	0.3 U	0.3	1.1	38.2	87	0.8	0.2 U
Copper	mg/kg	3830	21.2	16.9	17.5	14.5	17.6	18.2	45.7	70.5	257	55900	59.4	9.5
Lead	mg/kg	24	3 U	3 U	4	4	3	3 U	7	11	1330	2850	11	5
Nickel	mg/kg	25	11	14	15 J	9 J	13	13	20	25	53	2160	22	8
Zinc	mg/kg	68	25	245	28	28	29	26	53	126	2720	5270	83	57
Total Petroleum Hydrocarbons														
Diesel Range Hydrocarbons	mg/kg	6.7 J	6.6 U	6.7 U	6 U	5.6 U	6.4 U	6.6 U	5.2 U	11 J	91	130 J	15 J	6.4 U
Mineral Oil	mg/kg	22	13 U	13 U	12 U	11 U	13 U	13 U	10 U	57	150	470	40	13 U
Motor Oil	mg/kg	25	13 U	13 U	12 U	11 U	13 U	13 U	10 U	65	170	540	46	13 U
Polychlorinated Biphenyls[3]														
Aroclor 1242	µg/kg	55 U	4 U	3.9 U	4 U	3.9 U	3.9 U	3.9 U	3.9 U	41 U	310 U	7.2 UJ	5 U	5.1 U
Aroclor 1248	µg/kg	55 U	4 U	3.9 U	4 U	3.9 U	3.9 U	3.9 U	3.9 U	100 UY	1200 UY	25 UJ	50 UY	38 UY
Aroclor 1254	µg/kg	550 UY	4.2	5.6	5.1	4.9	7	3.9 U	30 UY	810 UY	3900	36 UJ	180	110
Aroclor 1260	µg/kg	1600	7.8	3.9 U	4 U	3.9 U	3.9 U	3.9 U	70	1800	4200	7.2 UJ	28	35
Aroclor 1262	µg/kg	55 U	4 U	3.9 U	4 U	3.9 U	3.9 U	3.9 U	3.9 U	41 U	310 U	280 J	5.1 U	5.1 U
Total PCBs	µg/kg	1600	12	5.6	5.1	4.9	7	3.9 U	70	1800	8100	280 J	208	145
Semivolatile Organic Compounds														
bis(2-Ethylhexyl)phthalate	µg/kg	61 U	61 U	63 U	59 U	59 U	63 U	60 U	65 U	62 U	1500	61 U	57 U	63 U
Di-n-Butylphthalate	µg/kg	61 U	61 U	63 U	59 U	59 U	63 U	60 U	65 U	62 U	1100	61 U	57 U	63 U

Notes:

1 Data qualifiers assigned independently by Informa LLC.
2 Duplicate sample.
3 Only results for Aroclors 1242 through 1262 are shown. Other aroclors were analyzed, but were not detected.

Abbreviations:

bgs Below ground surface
ft Feet
mg/kg Milligram per kilogram
µg/kg Microgram per kilogram

Qualifiers:

J Estimated value
U Not detected
UJ Not detected, estimated detection limit
UY Not detected, used for complex mixtures that overlap

Table 4
CMP Investigation Geoprobe Soil Analytical Results—Detected Compounds
Transect 2[1]

Location		T2B1	T2B1	T2B1	T2B2	T2B2	T2B2	T2B3	T2B3	T2B3	T2B4	T2B4	T2B4
Sample ID		JF-T2B1-SO-03	JF-T2B1-SO-08	JF-T2B1-SO-13	JF-T2B2-SO-03	JF-T2B2-SO-08	JF-T2B2-SO-13	JF-T2B3-SO-02	JF-T2B3-SO-08	JF-T2B3-SO-13	JF-T2B4-SO-03	JF-T2B4-SO-18	JF-T2B4-SO-23
Sample Date		01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011
Sample Depth (ft bgs)		3–5 ft	8–10 ft	13–15 ft	3–5 ft	8–10 ft	13–15 ft	2–4 ft	8–10 ft	13–15 ft	3–5 ft	18–20 ft	23–25 ft
Parameter	**Units**												
Metals													
Arsenic	mg/kg	6 U	6	7 U	19	7	6 U	8	8	7	8	14	180
Cadmium	mg/kg	0.4	0.2 U	0.4	0.3	0.3	0.3 U	0.4	0.3	0.3	0.8	29.4	2.1
Copper	mg/kg	17.4	20.9	20.5	44.5	25.7	17	37.8	43.3	30.6	48.2	688	209
Lead	mg/kg	8	6	3 U	36	46	5	22	31	30	87	886	300
Nickel	mg/kg	18	13	18	10	10	13	18	11	11	24	202	34
Zinc	mg/kg	42	36	35	67	79	695	119	59	60	225	5630	1520
Total Petroleum Hydrocarbons													
Diesel Range Hydrocarbons	mg/kg	20	6.2 U	16 J	21	270	6.5 U	7.8 J	8.2 J	110	42 J	2400	310
Mineral Oil	mg/kg	53	12 U	48	42	520	13 U	200	22	110	500	3900	1100
Motor Oil	mg/kg	58	12 U	52	46	570	13 U	220	25	120	550	4300	1200
Polychlorinated Biphenyls[2]													
Aroclor 1242	µg/kg	4 U	3.9 U	3.9 U	3.9 U	3.9 U	4 U	7.9 U	3.9 U	3.9 U	150 U	12000 U	3900 U
Aroclor 1248	µg/kg	4 U	3.9 U	3.9 U	3.9 U	3.9 U	4 U	7.9 U	3.9 U	3.9 U	440 UY	120000 UY	29000 UY
Aroclor 1254	µg/kg	4 U	3.9 U	3.9 U	3.9 U	3.9 U	4 U	34	3.9 U	3.9 U	1300	220000	61000
Aroclor 1260	µg/kg	4 U	3.9 U	3.9 U	3.9 U	4.9 UY	4 U	51	3.9 U	3.9 U	240	54000	11000
Aroclor 1262	µg/kg	9.8	3.9 U	3.9 U	4.5	3.9 U	4 U	7.9 U	6.7	4	150 U	12000 U	3900 U
Total PCBs	µg/kg	9.8	3.9 U	3.9 U	4.5	4.9 UY	4 U	85	6.7	4	1540	274000	72000
Low Molecular Weight Polycyclic Aromatic Hydrocarbons													
Naphthalene	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	130	780
Acenaphthene	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	120 U	94
Fluorene	µg/kg	66 U	62 U	62 U	73	63 J	65 U	64 U	60 U	65 U	63 U	120 U	62 U
Phenanthrene	µg/kg	66 U	62 U	62 U	630	84	65 U	64 U	60 U	65 U	63 U	120 U	130
Anthracene	µg/kg	66 U	62 U	62 U	120	63 U	65 U	64 U	60 U	65 U	63 U	120 U	62 U
2-Methylnaphthalene	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	120 U	150
High Molecular Weight Polycyclic Aromatic Hydrocarbons													
Fluoranthene	µg/kg	66 U	62 U	62 U	610 J	150 J	65 U	64 U	61 J	73 J	63 U	120 U	62 U
Pyrene	µg/kg	66 U	62 U	62 U	600	160	65 U	64 U	72	82	63 U	120 U	74
Benzo(a)anthracene	µg/kg	66 U	62 U	62 U	260	230	65 U	64 U	60 U	65 U	63 U	120 U	62 U
Chrysene	µg/kg	66 U	62 U	62 U	270	300	65 U	64 U	60 U	65 U	81 J	120 U	62 U
Total Benzofluoranthenes	µg/kg	66 U	62 U	62 U	380	600	65 U	64 U	81	67	63 U	120 U	62 U
Benzo(a)pyrene	µg/kg	66 U	62 U	62 U	260	730	65 U	64 U	60 U	65 U	63 U	120 U	62 U
Indeno(1,2,3-cd)pyrene	µg/kg	66 U	62 U	62 U	89	240	65 U	64 U	60 U	65 U	63 U	120 U	62 U
Dibenz(a,h)anthracene	µg/kg	66 U	62 U	62 U	61 U	420	65 U	64 U	60 U	65 U	63 U	120 U	62 U
Benzo(g,h,i)perylene	µg/kg	66 U	62 U	62 U	86	490	65 U	64 U	60 U	65 U	63 U	120 U	62 U
Semivolatile Organic Compounds													
1,2-Dichlorobenzene	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	270	62 U
1,4-Dichlorobenzene	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	150	62 U
1-Methylnaphthalene	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	120 U	74
2,4-Dinitrotoluene	µg/kg	330 U	310 U	310 U	300 U	310 J	330 U	320 U	300 U	320 U	310 U	610 U	310 U
4,6-Dinitro-2-Methylphenol	µg/kg	660 U	620 U	620 U	610 U	630 J	650 U	640 U	600 U	650 U	630 U	1200 U	620 U
4-Bromophenyl-phenylether	µg/kg	66 U	62 U	62 U	61 U	63 J	65 U	64 U	60 U	65 U	63 U	120 U	62 U
4-Chlorophenyl-phenylether	µg/kg	66 U	62 U	62 U	61 U	63 J	65 U	64 U	60 U	65 U	63 U	120 U	62 U
4-Nitrophenol	µg/kg	330 U	310 U	310 U	300 U	310 J	330 U	320 U	300 U	320 U	310 U	610 U	310 U
bis(2-Ethylhexyl)phthalate	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	63 U	16000	820
Di-n-Butylphthalate	µg/kg	66 U	62 U	62 U	61 U	63 U	65 U	64 U	60 U	65 U	65	2100	190
Hexachlorobenzene	µg/kg	66 U	62 U	62 U	61 U	63 J	65 U	64 U	60 U	65 U	63 U	120 U	62 U

Notes:

1 Data qualifiers assigned independently by Informa LLC.

2 Only results for Aroclors 1242 through 1262 are shown. Other aroclors were analyzed, but were not detected.

Abbreviations:

bgs Below ground surface

ft Feet

mg/kg Milligram per kilogram

µg/kg Microgram per kilogram

Qualifiers:

J Estimated value

U Not detected

UJ Not detected, estimated detection limit

UY Not detected, used for complex mixtures that overlap

Table 5
CMP Investigation Geoprobe Soil Analytical Results—Detected Compounds
Transect 3[1]

Location		T3B1	T3B1	T3B1	T3B2	T3B2	T3B2	T3B2	T3B3	T3B3	T3B3	T3B4	T3B4	T3B4
Sample ID		JF-T3B1-SO-03	JF-T3B1-SO-08	JF-T3B1-SO-13	JF-T3B2-SO-03	JF-T3B2-SO-08	JF-T3B2-SO-13	JF-T3B2-SO-13-D[2]	JF-T3B3-SO-03	JF-T3B3-SO-08	JF-T3B3-SO-13	JF-T3B4-SO-03	JF-T3B4-SO-13	JF-T3B4-SO-23
Sample Date		01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011
Sample Depth (ft bgs)		3–5 ft	8–10 ft	13–15 ft	3–5 ft	8–10 ft	13–15 ft	13–15 ft	3–5 ft	8–10 ft	13–15 ft	3–5 ft	13–15 ft	23–25 ft
Parameter	**Units**													
Metals														
Arsenic	mg/kg	6 U	6 U	7	5 U	6 U	6 U	6 U	6 U	20 U	6 U	10 U	7	6 U
Cadmium	mg/kg	0.2 U	0.2 U	0.3 U	0.2 U	0.3 U	0.3 U	0.2 U	2.1	6.5	0.5	6.9	0.2 U	0.2 U
Copper	mg/kg	15.4	14.7	29.2	16.3	22	24.9	25.1	62.6 J	354	38.8	111	51.8	10.5
Lead	mg/kg	2 U	2	3	7	3	3	3	27	208	24	259	7	2 U
Nickel	mg/kg	9	11	16	16	13	14	14	60	151	19	160	29	10
Zinc	mg/kg	26	34	37	42	31	37	39	116 J	6960	525	4720	142	29
Total Petroleum Hydrocarbons														
Diesel Range Hydrocarbons	mg/kg	6.5 U	6.1 U	220	9.3 J	6.6 U	6.8 U	6.7 U	9.4 J	46	7.7 J	42	59 J	7 U
Mineral Oil	mg/kg	13 U	12 U	540	33	13 U	14 U	14 U	36	190	28	350	2400	14 U
Motor Oil	mg/kg	13 U	12 U	600	36	13 U	14 U	14 U	40	200	31	380	2600	14 U
Polychlorinated Biphenyls[3]														
Aroclor 1242	µg/kg	3.9 U	3.9 U	8.5 U	3.8 U	3.9 U	6.6 U	8.4 U	8.5 UJ	20 UJ	8.8 U	13 U	3.8 U	3.9 U
Aroclor 1248	µg/kg	3.9 U	3.9 U	17 UY	3.8 U	3.9 U	17 UY	21 UY	8.5 UJ	79 UJ	8.8 U	170 UY	3.8 U	3.9 U
Aroclor 1254	µg/kg	3.9 U	3.9 U	37	3.8 U	3.9 U	34	54	13 UJ	270 J	22 UY	540	17 J	4.5 J
Aroclor 1260	µg/kg	3.9 U	3.9 U	8.5 U	3.8 U	3.9 U	6.6 U	8.4 U	8.5 UJ	400 J	54 J	290	11 J	3.9 U
Aroclor 1262	µg/kg	3.9 U	3.9 U	28	13 J	3.9 U	6.6 U	8.4 U	140 J	20 UJ	8.8 U	13 U	3.8 U	3.9 U
Total PCBs	µg/kg	3.9 U	3.9 U	65	13 J	3.9 U	34	54	140 J	670 J	54 J	830	28 J	4.5 J
Low Molecular Weight Polycyclic Aromatic Hydrocarbons														
Phenanthrene	µg/kg	64 U	60 U	67	60 U	66 U	62 U	61 U	64 U	91	62 U	63 U	180 U	63 U
High Molecular Weight Polycyclic Aromatic Hydrocarbons														
Benzo(a)anthracene	µg/kg	64 U	60 U	62 U	60 U	66 U	62 U	61 U	64 U	63 U	62 U	63 U	180 U	63 U
Total Benzofluoranthenes	µg/kg	64 U	60 U	62 U	60 U	66 U	62 U	61 U	64 U	63 U	62 U	66	180 U	63 U
Semivolatile Organic Compounds														
bis(2-Ethylhexyl)phthalate	µg/kg	64 U	60 U	62 U	60 U	66 U	62 U	61 U	64 U	63 U	62 U	590	180 U	63 U
Di-n-Butylphthalate	µg/kg	64 U	60 U	62 U	60 U	66 U	62 U	61 U	120	790	62 U	380	180 U	63 U

Notes:

1 Data qualifiers assigned independently by Informa LLC.
2 Duplicate sample.
3 Only results for Aroclors 1242 through 1262 are shown. Other aroclors were analyzed, but were not detected.

Abbreviations:

bgs Below ground surface
ft Feet
mg/kg Milligram per kilogram
µg/kg Microgram per kilogram

Qualifiers:

J Estimated value
U Not detected
UJ Not detected, estimated detection limit
UY Not detected, used for complex mixtures that overlap

Table 6
CMP Investigation Geoprobe Groundwater Analytical Results—Detected Compounds[1]

Location		T1B2	T1B3	T1B4	T2B2	T2B3	T2B3	T2B4	T3B2	T3B3	T3B4
Sample ID		JF-T1B2-GW-15	JF-T1B3-GW-20	JF-T1B4-GW-20	JF-T2B2-GW-15	JF-T2B3-GW-15	JF-T2B3-GW-15-D[2]	JF-T2B4-GW-20	JF-T3B2-GW-15	JF-T3B3-GW-15	JF-T3B4-GW-24
Sample Date		1/14/2011	01/14/2011	01/14/2011	01/13/2011	01/13/2011	01/13/2011	01/13/2011	01/14/2011	01/13/2011	01/13/2011
Sample Depth (ft bgs)		15	20	20	15	15	15	20	15	15	24
Parameter	**Units**										
Polychlorinated Biphenyls[3]											
Aroclor 1242	µg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.01 U	0.01 U
Aroclor 1248	µg/L	0.01 U	0.014 UY	0.031 UY	0.01 U	0.01 U	0.01 U	1.8	0.01 U	0.01 U	0.01 U
Aroclor 1254	µg/L	0.01 U	0.022	0.054	0.01 U	0.01 U	0.01 U	2.5	0.01 U	0.018	0.01 U
Aroclor 1260	µg/L	0.01 U	0.011	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.017	0.01 U
Aroclor 1262	µg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.2 U	0.01 U	0.014 UY	0.01 U
Total PCBs	µg/L	0.01 U	0.033	0.054	0.01 U	0.01 U	0.01 U	4.3	0.01 U	0.035	0.01 U
Volatile Organic Compounds											
1,1,1-Trichloroethane	µg/L	0.3	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chloroform	µg/L	0.5	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
cis-1,2-Dichloroethene	µg/L	14	1.5	3	2.3	1.3	1.3	0.4	2.9	0.2 U	0.2 U
Tetrachloroethene	µg/L	1.2	0.2 U	0.2 U	0.2 U	0.8	0.8	0.2 U	0.2 U	0.2 U	0.2 U
trans-1,2-Dichloroethene	µg/L	0.5	0.2	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Trichloroethene	µg/L	130	3.1	5.2	0.5	4.4	4.5	1	6.4	0.6	0.2
Vinyl Chloride	µg/L	0.2 U	0.2 U	0.2 U	0.2 U	0.3	0.3	0.2 U	0.6	0.2 U	0.2 U

Notes:

1 Data qualifiers assigned independently by Informa LLC.
2 Duplicate sample.
3 Only results for Aroclors 1242 through 1262 are shown. Other aroclors were analyzed, but were not detected.

Abbreviations:

bgs Below ground surface
ft Feet
µg/L Microgram per liter

Qulaifiers:

U Not detected
UJ Not detected, estimated detection limit
UY Not detected, used for complex mixtures that overlap

Table 7
Solid Samples Collected from Manholes

Manhole	Associated Pipe	Sample ID	Description
15B	12-inch	JF-PLSD-PS-15B	Brown, coarse gravelly sand. 20% organic matter. No sheen or odor. Moist. (PID: 0.4 ppm)
15A	12-inch	JF-PLSD-PS-15A	Coarse, angular gravel with very few fines. Few twigs. (PID: 0.3 ppm)
Public	24-inch	JF-PLSD-PS-PUBLIC	Coarse black sand, 2% gravel, and fine sands and mud. Light petroleum sheen and odor. Few twigs, leaves, and minor plastic pieces. Very saturated—sample was collected through 3 to 4 inches of water. (PID: 0.0 ppm)
37-2	24-inch	JF-PLSD-PS-37-2	Medium coarse sand, 25% gravel, few 2-inch pieces of rock. Reddish brown oxidation streaking. Cohesive material noted in some scoops. Iridescent sheen. No anthropogenic material. Very wet with free water. (PID: 0.5 ppm)
37-7	24-inch	JF-PLSD-PS-37-7	Dark gray to reddish brown, primarily silt with sand and minor gravel. Few pine needles and roots. Easily homogenizable. Light sheen. No odor. (PID: 0.1 ppm)
24B	24-inch	JF-PLSD-PS-24B	Medium brown silty sand with few coarse gravels. Many small, less than ½-inch, brick fragments. Slight sheen. No odor. (PID: 0.5 ppm)
24A	24-inch	JF-PLSD-PS-24A	Very coarse gravel with very few fines. Some slag present—probably from ground surface. Few roots. No sheen or odor. Wet—sample collected through 1 to 2 inches of water. (PID: 0.4 ppm)

Abbreviations:

PID Photoionization detector
ppm parts per million

Table 8
CMP Investigation Manhole Solids Analytical Results—Detected Compounds[1]

	Location	Public-SDMH-II	SDMH 15A	SDMH 15B	SDMH 24A	SDMH 24B	SDMH 24B	SDMH 37-2	SDMH 37-7
	Sample ID	JF-PLSD-PS-PUBLIC	JF-PLSD-PS-15A	JF-PLSD-PS-15B	JF-PLSD-PS-24A	JF-PLSD-PS-24B	JF-PLSD-PS-24B-D[2]	JF-PLSD-PS-37-2	JF-PLSD-PS-37-7
	Sample Date	01/24/2011	01/24/2011	01/24/2011	01/24/2011	01/24/2011	01/24/2011	01/24/2011	01/24/2011
Parameters	**Units**								
Metals									
Arsenic	mg/kg	30	30	70	30 U	40	34	45	40
Cadmium	mg/kg	4	1 U	21	1 U	0.8	1.1	9.2	2.8
Copper	mg/kg	159	838	4060	333	190 J	265 J	332	271
Lead	mg/kg	358	180	1410	80	335 J	420 J	1000	839
Nickel	mg/kg	64	1590	837	648	136 J	174 J	154	97
Zinc	mg/kg	569	698	5490	789	367	441	822	749
Total Petroleum Hydrocarbons									
Diesel Range	mg/kg	540	32 J	800 J	16 J	1100 J	810 J	5100 J	1100 J
Mineral Oil	mg/kg	1500	77	1600	50	1200	1100	4900	2000
Motor Oil	mg/kg	1600	85	1800	56	1300	1200	5400	2200
Polychlorinated Biphenyls[3]									
Aroclor 1242	µg/kg	44000 U	1800 U	22000 U	1900 U	210000 U	84000 U	2000000 U	320000 U
Aroclor 1248	µg/kg	87000 UY	26000	160000 UY	19000 UY	740000 UY	840000 UY	6100000 UY	1100000 UY
Aroclor 1254	µg/kg	150000	36000	630000	39000	1600000	1700000	8800000	1900000
Aroclor 1260	µg/kg	44000 U	6000	120000	4800 UY	210000 U	210000 UY	2000000 U	320000 U
Aroclor 1262	µg/kg	44000 U	1800 U	22000 U	1900 U	210000 U	84000 U	2000000 U	320000 U
Total PCBs	µg/kg	150000	68000	750000	39000	1600000	1700000	8800000	1900000
Low Molecular Weight Polycyclic Aromatic Hydrocarbons									
Naphthalene	µg/kg	180 U	63 U	180 U	61 U	64 U	61 U	320 U	92
Acenaphthylene	ug/kg	180 U	63 U	460	61 U	64 U	61 U	320 U	62 U
Acenaphthene	µg/kg	180 U	63 U	180 U	61 U	64 U	61 U	380	110
Fluorene	µg/kg	180 U	63 U	180 U	61 U	64 U	61 U	570	210
Phenanthrene	µg/kg	1000	63 U	450	61 U	500	320	3500	1600
Anthracene	µg/kg	340	63 U	200	61 U	79	61 U	780	320
High Molecular Weight Polycyclic Aromatic Hydrocarbons									
Fluoranthene	µg/kg	6100	63 U	3000	61 U	880	560	5400	3100
Pyrene	µg/kg	14000	63 U	2500	61 U	770	500	5600	3100
Benzo(a)anthracene	µg/kg	5700	63 U	1900	61 U	410	220	2900	1600
Chrysene	µg/kg	7000	63 U	2000	61 U	460	320	3500	1800
Total	µg/kg	12000	63 U	4600	61 U	840	570	6700	4200
Benzo(a)pyrene	µg/kg	6500	63 U	1900	61 U	410	260	3400	1600
Indeno(1,2,3-cd)pyrene	µg/kg	1900	63 U	810	61 U	230	120	1200	710
Dibenz(a,h)anthracene	µg/kg	230 J	63 U	180 U	61 U	64 U	61 U	320 U	62 U
Benzo(g,h,i)perylene	µg/kg	2000 J	63 U	740 J	61 U	220 J	110 J	960 J	650 J
Semivolatile Organic Compounds									
Butylbenzylphthalate	µg/kg	180 U	10000	180 U	61 U	64 U	61 U	320 U	62 U
Carbazole	µg/kg	180 U	63 U	180 U	61 U	64 U	61 U	480	210
Di-n-Butylphthalate	µg/kg	580	9200	620	61 U	64 U	61 U	5200	62 U
Dibenzofuran	µg/kg	180 U	63 U	180 U	61 U	64 U	61 U	320 U	100
Dimethylphthalate	µg/kg	180 U	63 U	430	61 U	230	61 U	320 U	62 U

Notes:

1 Data qualifiers assigned independently by Informa LLC.
2 Duplicate sample.
3 Only results for Aroclors 1242 through 1262 are shown. Other aroclors were analyzed, but were not detected.

Abbreviations:

CMP Corrugated metal pipe
mg/kg Milligram per kilogram
µg/kg Microgram per kilogram

Qualifiers:

J Estimated value
U Not detected
UB Not detected at elevated reporting limit due to blank contamination
UJ Not detected, estimated detection limit
UY Not detected, used for complex mixtures that overlap

Table 9
Lateral Samples Analytical Results

Sample Location	Lumber from Jorgensen 10-inch Lateral		Wipe Sample from Jorgensen 4-inch Lateral	
Sample ID	JF-PLSD-WD-12		JF-PLSD-WP-4L	
Sample Date	2/25/2011		2/28/2011	
Parameter		Units		Units
Aroclor 1016	790 U	µg/kg	1 U	µg
Aroclor 1221	791 U	µg/kg	1 U	µg
Aroclor 1232	792 U	µg/kg	1 U	µg
Aroclor 1242	793 U	µg/kg	1 U	µg
Aroclor 1248	12000 UY	µg/kg	4 UY	µg
Aroclor 1254	34000	µg/kg	4.9	µg
Aroclor 1260	2000 Y	µg/kg	1 U	µg
Aroclor 1262	790 U	µg/kg	NA	µg
Total PCBs	34000	µg/kg	4.9	µg

Note:

1 Data qualifiers assigned independently by Informa LLC.

Abbreviations:

µg Microgram

µg/kg Microgram per kilogram

Qualifiers:

U Not detected

UY Not detected, used for complex mixtures that overlap

Jorgensen Forge Outfall Site
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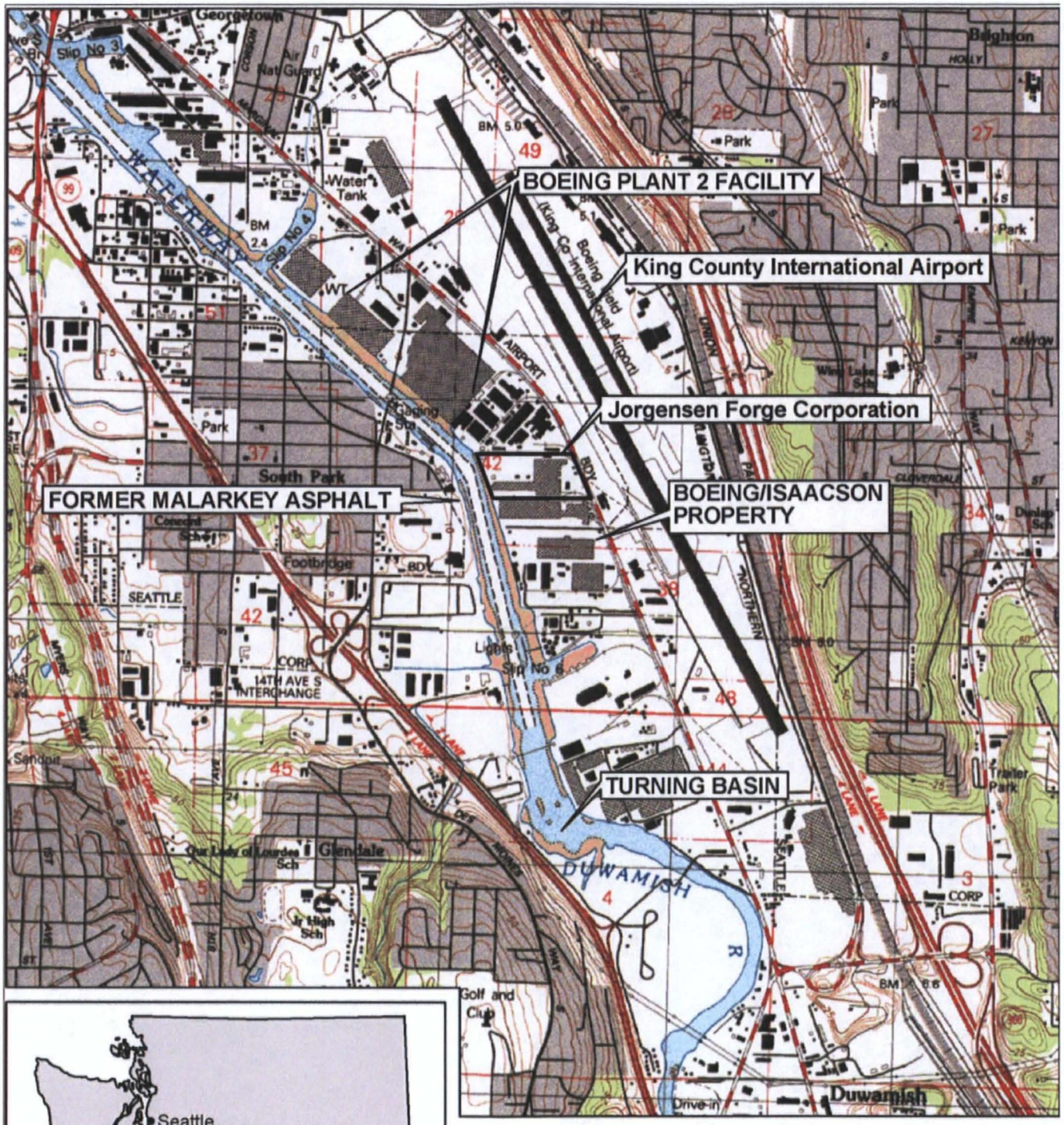
Figures



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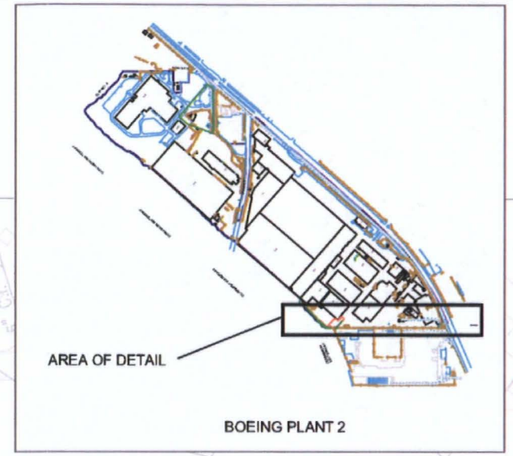
Seattle, Washington

Figure 1
Site Vicinity Map

LEGEND

SDMH	Storm Drain Manhole	CDF	Controlled Density Fill
o	Existing Storm Drain Manhole Sealed Under Order	CMP	Corrugated Metal Pipe
———	12" Clay Property Line Storm Drain Cleaned Under Order	———	CMP Section (Not Addressed Under Order)
———	24" Clay Property Line Storm Drain Cleaned Under Order	Note: Survey conducted by Duane Hartman and Associates, Inc. 2010.	



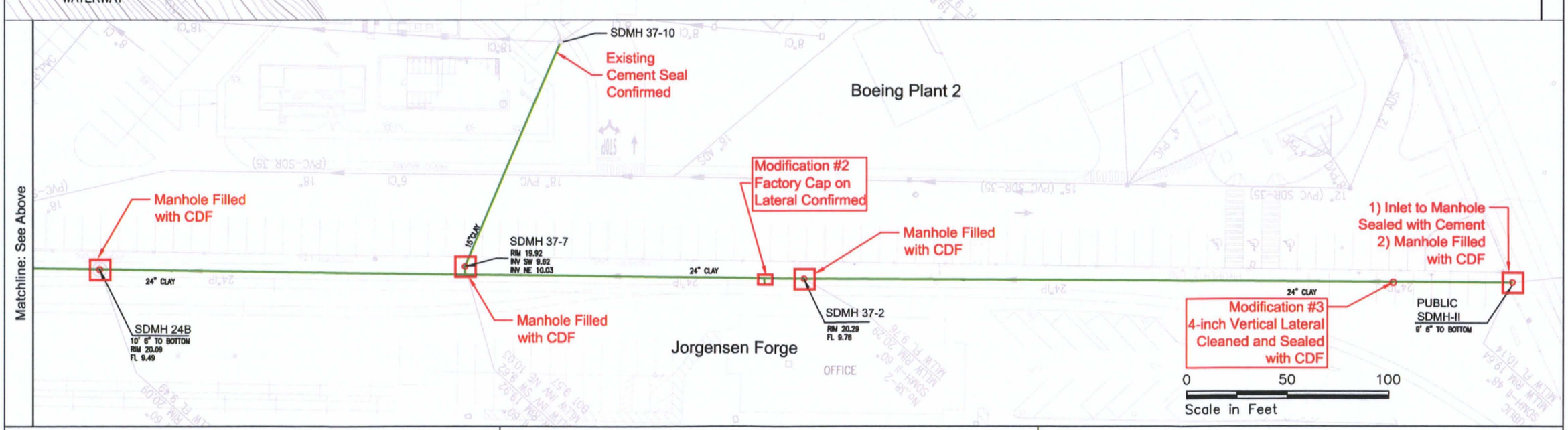


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Figure 2
Site Plan and Approved Modifications to Work Plan

DWG NAME: G:\project\Clients\Floyd and Snider\boeing\Plant 2 CAD 2010\boeing2010_011.dwg
DATE: 5/26/2011 1:58 PM

Notes:
1. CMP = Corrugated metal pipe.
· GPS locations were collected during field activities on January 14, 2011.
· Orthoimagery provided by Bing Maps.

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Figure 3
Geoprobe Boring Locations

Path: F:\projects\Boeing Plant 2 NEW\GIS\MXD\JorgensenForge\January 15 2011 Field-Collected GPS Locations and CAD SD Layers from March 2011.mxd
Date: 5/26/2011

Boeing Plant 2

SDMH 15A	January 2011
PCBs	JF-PLSD-PS-15A
Aroclor 1242	1,800 U
Aroclor 1248	26,000
Aroclor 1254	36,000
Aroclor 1260	6,000
Total	**68,000**

SDMH 15B	January 2011
PCBs	JF-PLSD-PS-15B
Aroclor 1242	22,000 U
Aroclor 1248	160,000 UY
Aroclor 1254	630,000
Aroclor 1260	120,000
Total	**750,000**

PIPE MATERIALS CHANGE FROM CLAY TO CMP
12" CMP
24" CMP
SDMH 36-83
12" CLAY
SDMH 15A
9' TO BOTTOM
12" CLAY
SDMH 15B
7'3" TO BOTTOM
SDMH 24A
10' 6" TO BOTTOM
8"
24" CLAY
SDMH 24B
10' 6" TO BOTTOM
24" CLAY
15" CLAY
SDMH 37-10
SDMH 37-7
SDMH 37-2
Jorgensen Visitor Parking Lot 4-Inch Lateral
PUBLIC SDMH-II
LOWER DUWAMISH WATERWAY
EAST MARGINAL WAY

SDMH 24A	January 2011
PCBs	JF-PLSD-PS-24A
Aroclor 1242	1,900 U
Aroclor 1248	19,000 UY
Aroclor 1254	39,000
Aroclor 1260	4,800 UY
Total	**39,000**

SDMH 24B	January 2011
PCBs	JF-PLSD-PS-24B-D
Aroclor 1242	84000 U
Aroclor 1248	840,000 UY
Aroclor 1254	1,700,000
Aroclor 1260	210,000 UY
Total	**1,700,000**

SDMH 37-7	January 2011
PCBs	JF-PLSD-PS-37-7
Aroclor 1242	320,000 U
Aroclor 1248	1,100,000 UY
Aroclor 1254	1,900,000
Aroclor 1260	320,000 U
Total	**1,900,000**

SDMH 37-2	January 2011
PCBs	JF-PLSD-PS-37-2
Aroclor 1242	2,000,000 U
Aroclor 1248	6,100,000 UY
Aroclor 1254	8,800,000
Aroclor 1260	2,000,000 U
Total	**8,800,000**

Public-SDMH-II	January 2011
PCBs	JF-PLSD-PS-PUBLIC
Aroclor 1242	44,000 U
Aroclor 1248	87,000 UY
Aroclor 1254	150,000
Aroclor 1260	44,000 U
Total	**150,000**

Abbreviations:

CMP Corrugated Metal Pipe
µg/kg Microgram per kilogram

Data Qualifiers:

U Not detected
UY Not detected, used for complex mixtures that overlap

Note: Data qualifiers assigned independently by Informa LLC.

0 100 200
Scale in Feet

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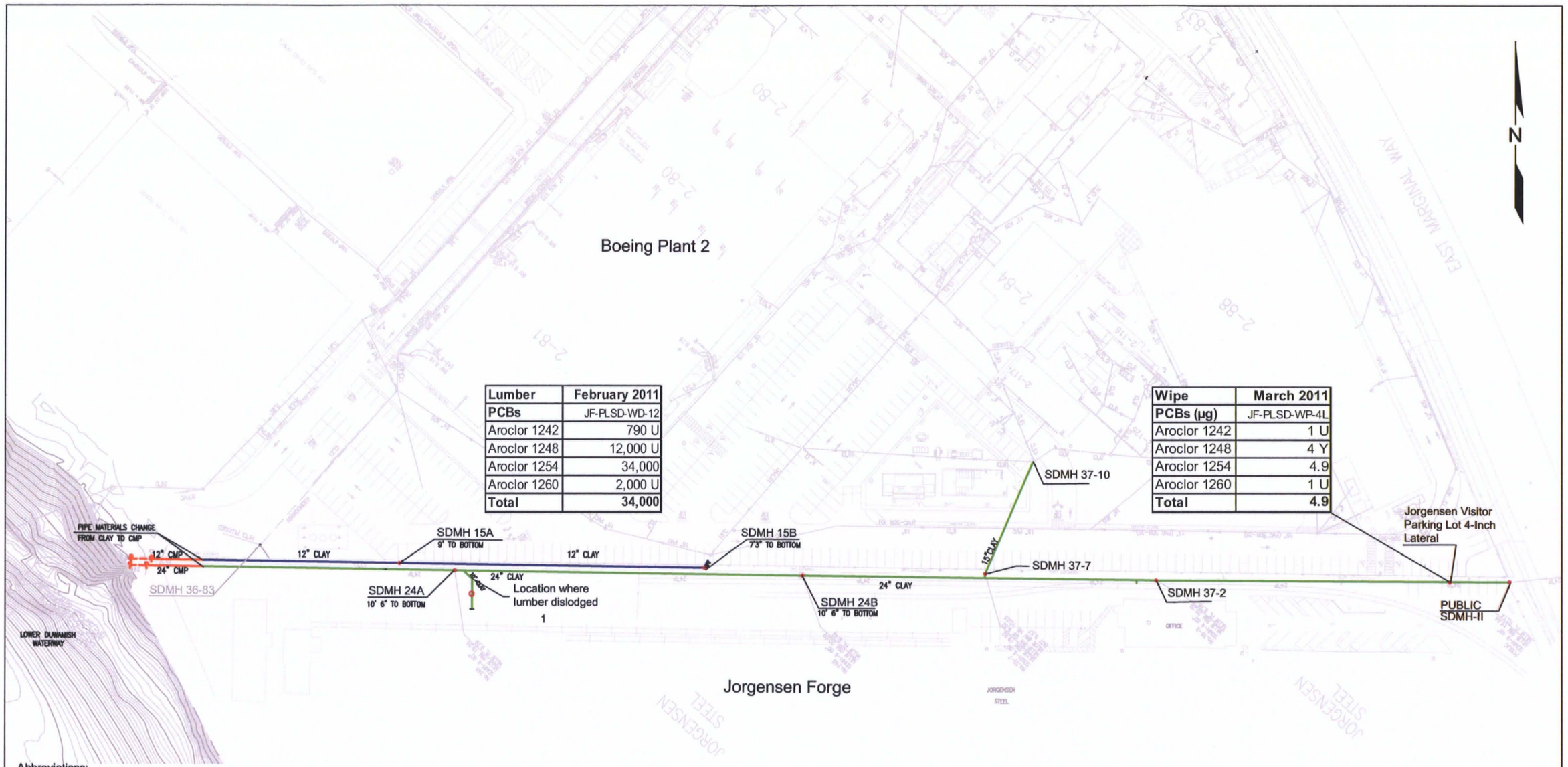
Figure 4
Manhole Samples
PCB Analytical Results (µg/kg)

DWG NAME: G:\project\Clients\Floyd and Snider\boeing\Plant 2 CAD 2010\boeing2010_011.dwg
DATE: 5/26/2011 1:59 PM



Lumber	February 2011
PCBs	JF-PLSD-WD-12
Aroclor 1242	790 U
Aroclor 1248	12,000 U
Aroclor 1254	34,000
Aroclor 1260	2,000 U
Total	**34,000**

Wipe	March 2011
PCBs (µg)	JF-PLSD-WP-4L
Aroclor 1242	1 U
Aroclor 1248	4 Y
Aroclor 1254	4.9
Aroclor 1260	1 U
Total	**4.9**

Abbreviations:

CMP Corrugated Metal Pipe
µg/kg Microgram per kilogram

Data Qualifiers:

U Not detected
UY Not detected, used for complex mixtures that overlap

Note: Data qualifiers assigned independently by Informa LLC.

[1] As described in Section 2.6.2, lumber was dislodged from 10-inch lateral at shown location. Refer to Section 2.6.2 for details on how the lumber was sampled.

0 100 200
Scale in Feet

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Figure 5
Lateral Samples
PCB Analytical Results (µg/kg)

DWG NAME: G:\project\Clients\Floyd and Snider\boeing\Plant 2 CAD 2010\boeing2010_011.dwg
DATE: 5/26/2011 2:01 PM

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Appendix A
Tidal Survey Transducer Data
(Excel files provided on DVD)

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Appendix B
Boring Logs

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Boring ID: T1B1

Drill Date: January 14, 2011
Logged By: Dean Brame
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 feet
Groundwater ATD (ft bgs): 9.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,811.3
Longitude/Easting: 1,275,874.8

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8531 E Marginal Way S., Seattle, WA

Remarks: weather cool, raining

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Pothole of asphalt surface with crushed gravel base
T1B1 3-5 (PID: 2.6 ppm)		3	SP	Dark brown SAND, loose, moist (FILL). Black line from 4 to 4.1 ft bgs.
		5		
		6	SP	Brown fine grained SAND, dense, moist (Fill)
		7	ML	Reddish-brown, SILT, moist (FILL)
T1B1 8-10 (1.8 ppm)		8	SM	Brown very fine silty SAND, moist to wet, dark brown streaks throughout (FILL) Saturated at 9.5 ft bgs.
		11	SP	Dark gray fine SAND, saturated (NATIVE)
T1B1 13-15 (2.2 ppm)		13	SP	Dark gray very fine SAND, saturated, (NATIVE)
		15		

Notes:
FT BGS = Feet Below Ground Surface
= denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T1B2

Drill Date: January 14, 2011
Logged By: Dean Brame
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 8.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,811.2
Longitude/Easting: 1,275,856.4

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Pothole of asphalt surface with crushed gravel base
		2	SW	Dark brown coarse SAND, loose, moist, (FILL)
T1B2 3-5 (PID: 1.8 ppm)		4	SM	Dark brown silty SAND, dense, very moist, with orange streaking, (FILL)
		6		
		7	SP	Dark brown SAND, moist, some oxidation (FILL). Saturated at 8.5 ft bgs.
T1B2 8-10 (2.3 ppm)		9		Grayish-brown, very silty SAND, wet (FILL) from 9.8 - 10 ft bgs.
		10	SM	
		11	SP	Dark brown SAND, saturated, mottled (FILL?)
		12	SM	Gray silty SAND, loose, saturated, (NATIVE)
		13	SP	Dark gray very fine SAND, loose, saturated, mottled (NATIVE)
T1B2 13-15 (2.1 ppm)		15		

Notes:
FT BGS = Feet Below Ground Surface
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USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T1B3

Drill Date: January 14, 2011
Logged By: Dean Brame
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft
Groundwater ATD (ft bgs): 8.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,811.1
Longitude/Easting: 1,275,808.3

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy/cloudy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Woody plant material, crushed gravel, some small pieces of asphalt
		2	GW	Coarse crushed GRAVEL with light brown SAND, loose, dry (FILL)
		3	SW	Dark brown gravelly SAND with trace silt, moist (FILL)
T1B3 3-5 (PID: 1.6 ppm)		4	SP	Dark brown coarse SAND, moist (FILL)
		7	SP	Dark brown, moist coarse SAND with rounded gravel, moist (FILL) 1" Dark brown to black stain at 7.5 ft. Mesh (geotextile?) at 8.5 ft bgs.
T1B3 8-10 (2.2 ppm)		9	GW	very coarse crushed GRAVEL with trace sand, moist (FILL)
		10	SM	Dark brown silty SAND, wet, with glass and metal debris (FILL)
		10	GW	Dark brown rounded GRAVEL with coarse sand, loose, very wet, with small pieces of glass from 10-12 ft. (FILL)
		16	GW	Dark brown sandy GRAVEL, loose, saturated (FILL)
		17	SP	Dark brown very fine Sand (FILL?)
T1B3 18-20 (2.1		18	SM	Gray fine silty SAND, saturate, with mottles (NATIVE) Moderate petroleum sheen and odor at 19.5 ft

Notes:
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USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T1B4

Drill Date: January 14, 2011
Logged By: Dean Brame
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 20 ft
Groundwater ATD (ft bgs): 9 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,819.1
Longitude/Easting: 1,275,763.2

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy/cloudy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Woody plant material and some crushed gravel
		1	GW	Light gray crushed GRAVEL, dry, (FILL)
		2	SW	Very dark brown gravelly SAND, loose, dry (FILL). Very oxidized throughout. Few white and blue crytals.
		3		
T1B4 3-5 (PID: 3.4 ppm)		4		Very dark brown to black stain at 4 - 4.2 ft bgs.
		5		2" diameter blue crystal at 4.5ft bgs.
		6		
		7	SW	Very dark brown, gravelly sand, loose, dry (FILL)
		8	SP	Reddish brown fine grained SAND, moist (FILL)
		9	SP	Dark gray, medium grained SAND, wet with few small blue crystals (FILL)
		10		
		11		
		12	SP	Grayish-brown, medium grained SAND, very wet with some oxidation (FILL)
T1B4 12-14 (1.4 ppm)		13		
		14	SW	Reddish-brown fine SAND with minor small gravel, very wet (FILL)
		15	SP	Dark brown, fine SAND, very wet (FILL)
		16		
		17		
		18	GW	Reddish-brown fine sandy GRAVEL, loose, saturated. 1-1.5" pebbles (FILL)
T1B4 18.5-20 (2.1 ppm)		19	SP	Very dark gray fine SAND, saturated, minor mottling (NATIVE)
		20		

Notes:
FT BGS = Feet Below Ground Surface
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USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T2B1

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 7.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,796.5
Longitude/Easting: 1,275,886.8

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0–2		Dark gray crushed gravel and slag (FILL)
		2–3	SM	Dark brown silty SAND with few small gravel, loose, dry (FILL). Gravel is mixed round and angular.
T2B1 3-5 (PID: 0.5 ppm)		3–5	SM	Dark gray silty SAND, dense, moist (FILL)
		5–6		
		6–8	SP	Brown-gray fine SAND, dense, wet (FILL) Saturated at 7.5 ft
T2B1 8-10 (0.6 ppm)		8–10	SM	Brown-gray very fine silty SAND, dense, very wet (FILL)
		10–11		
		11–12	SP	Reddish-brown fine SAND, very wet, mottled (NATIVE)
T2B1 13-15 (34 ppm)		12–15	SM	Dark gray fine silty SAND, very wet (NATIVE) Saturated after 13ft. Petroleum odor and sheen present at 13 .5 ft.

Notes:
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= denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T2B2

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 9 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,797.9
Longitude/Easting: 1,275,856.3

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy/cloudy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Dark gray crushed gravel and slag (FILL)
		1	SW	Dark brown gravelly SAND, loose, dry (FILL). Some metallic slag-like material, whitish-yellow material (fire brick?) and red brick fragments.
		2	SM	Brown silty fine SAND, loose, dry (FILL). Few 0.5-1" gravels and small brick fragments.
T2B2 3-5 (PID: 1.1 ppm)		3		
		4		
		5		
		6	SP	Dark gray medium SAND, dense, moist, with pieces of glass (FILL)
		7	SP	Dark reddish-brown fine SAND, dense, wet (FILL). Red brick fragments at 7.5 ft. Lumber debri at 9.5 ft.
T2B2 8-10 (0.6 ppm)		8		
		9		
		10		
		11	SM	Brown silty SAND with few small gravel, wet (FILL)
		12	SM	Gray silty SAND,loose, saturated (NATIVE)
		13		
T2B2 13-15 (0.9 ppm)		14		
		15		

Notes:
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Boring ID: T2B3

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 12.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,798.6
Longitude/Easting: 1,275,824.9

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy/cloudy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Crushed gravel and woody plant material
T2B3 2-4 (PID: 0.8 ppm)		1–3	SM/SW	Brown silty fine SAND and gravelly fine SAND, loose, dry (FILL). Gravel is mixed round and angular.
		4–5		
		6	SM/SW	same as above
T2B3 8-10 (0.8 ppm)		7–10		Black tar-like material (possibly asphalt) at 8.5 ft bgs.
		11–12		
		12	SM	Reddish-brown silty SAND wth few rounded gravel, wet, some oxidation, glass and brick fragments (FILL)
T2B3 13-15 (1.4 ppm)		13–15	SP	Dark gray fine SAND, saturated, with glass shards, lumber debris, and brick fragments (FILL) Note: Unable to drill to native material due to refusal and poor recovery at 15 ft bgs.

Notes:
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USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T2B4

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 25 ft
Groundwater ATD (ft bgs): 8.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,799.5
Longitude/Easting: 1,275,795.3

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0–2		Crushed gravel and woody plant material mixed with soil
T2B4 2-4 (PID: 0.9 ppm)		3–4	SM/SW	Dark brown silty SAND with gravel, moist (FILL). No petroleum sheen or odor.
		5–7		
		8	SW	Brown gravelly SAND, loose, wet (FILL). Gravel is small and mixed rounded and angular. Black, tar-like material at 9 ft. No petroleum sheen or oder present.
(1.3 ppm)		10–13		Reddish-brown medium SAND with rounded gravel, wet (FILL)
(1.0 ppm)		14–15	SP	
		16–17	SP	Reddish-brown medium SAND with rounded gravel, loose, saturated (FILL). Glass shards and brick fragments. Petroleum odor and sheen observed.
T2B4 18-20 (37.4 ppm)		18–20		2-inch layer of broken glass and crushed rock at 18 ft bgs
		21		
		22–23	SP	Reddish-brown medium SAND with rounded gravel, loose, very wet (FILL). Few glass shards.
T2B4 23-25 (31.5		24–25	SP	Gray fine SAND with few small pebbles, wet (NATIVE)

Notes:
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Boring ID: T3B1

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 9.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,770.3
Longitude/Easting: 1,275,888.6

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Crushed gravel with few slag
		1	SW	Dark brown and black gravelly SAND with and red brick fragments, dry (FILL)
		2	SP	Reddish-brown fine SAND, loose, dry (FILL)
		3		Turns to gray color at 4.5 ft bgs.
T3B1 3-5 (PID: 1.1 ppm)		4		
		5		
		6	SP	Gray fine SAND, dense, moist (FILL)
		7	SP	Dark gray medium sand, loose, moist (FILL). Tree branch fragment at 7.5 ft.
		8	SP	Gray coarse SAND, loose, moist (FILL)
T3B1 8-10 (3.6 ppm)		9	ML	Gray and reddish brown SILT, very soft, saturated (NATIVE)
		10	SM	Gray silty fine SAND, dense, saturated (NATIVE)
		11		
		12		
		13		
T3B1 13-15 (176 ppm)		14	ML/SP	Lense of gray fine sandy SILT 14 - 14.3 ft with gray very fine SAND below (NATIVE). Petroleum odor and sheen observed.
		15		

Notes:
FT BGS = Feet Below Ground Surface
= denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

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Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 14 ft

Boring ID: T3B2

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,771.6
Longitude/Easting: 1,275,859.1

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy, approx 50 degrees

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Crushed gravel
		1	SW	Dark brown gravelly SAND, loose, dry (FILL)
		2	SP	Brown very fine SAND with trace gravel, moist (FILL). No petroleum odor or sheen, no fill debris observed.
T3B2 3-5 (PID: 1.6 ppm)		3		
		4		
		5		
		6	SP	Brown fine SAND, moist (FILL). No gravel, no petroleum odor or sheen.
		7	SM	Light brown, silty SAND, stiff, dry (FILL?).
		8	SM	Light reddish-brown, fine silty SAND, moist (NATIVE).
T3B2 8-10 (1.9 ppm)		9	SP	Gray and red fine SAND, dense, moist (NATIVE).
		10		
		11	SM	Llight brown, silty SAND mottled with light reddish-brown, moist (NATIVE).
		12		
		13	ML	Reddish-gray fine sandy SILT, very soft, moist (NATIVE). No gravel or debris fill noted. No petroleum sheen or odor.
T3B2 13-15 (1.9 ppm)		14	ML	Gray, sandy SILT, stiff, wet (NATIVE). No gravel or debris fill observed. No petroleum sheen or odor.
		15		

Notes:
FT BGS = Feet Below Ground Surface
= denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T3B3

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 13 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,770.7
Longitude/Easting: 1,275,827.1

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather cloudy and rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Crushed gravel and woody plant material.
		1		
		2	SP	Reddish-brown, fine SAND, moist with trace gravel and some asphalt pieces throughout, moist (FILL). No petroleum sheen or odor. No debris fill observed.
T3B3 3-5 (PID: 1.3 ppm)		3		
		4		
		5		
		6		
		7		
		8	SP	Reddish-brown fine SAND, moist (FILL). Minimal recovery
T3B3 8-10 (1.8 ppm)		9		Whitish-red brick fragments at 10 ft bgs.
		10		
		11		
		12		
		13	SM	Gray very fine silty SAND, wet (NATIVE).
T3B3 13-15 (2.2 ppm)		14		
		15		

Notes:
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USCS = Unified Soil Classification System, modified from ASTM D2488

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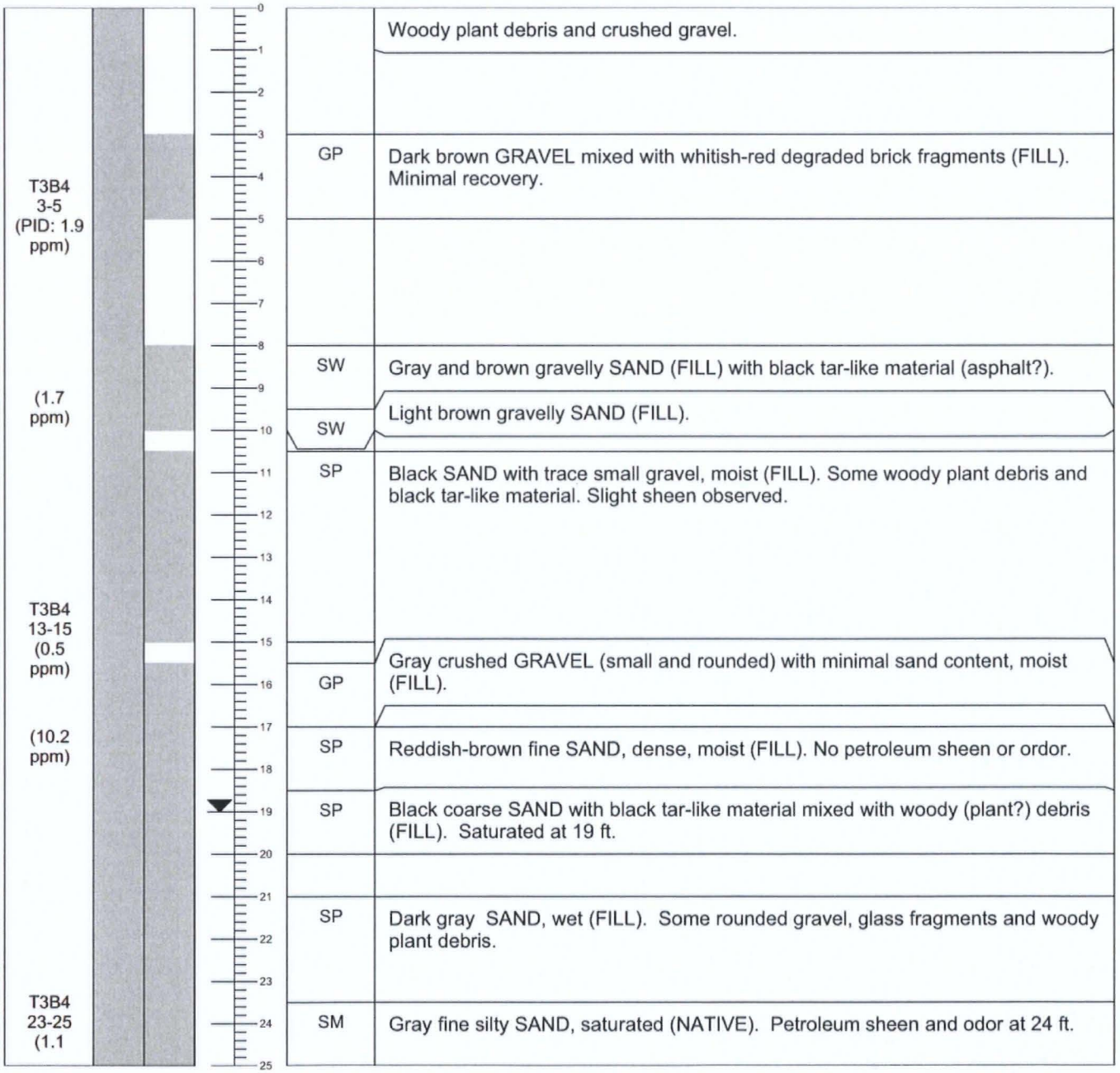
Boring ID: T3B4

Drill Date: January 13, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 25 ft
Groundwater ATD (ft bgs): 19 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,771.2
Longitude/Easting: 1,275,805.8

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy



Notes:
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USCS = Unified Soil Classification System, modified from ASTM D2488

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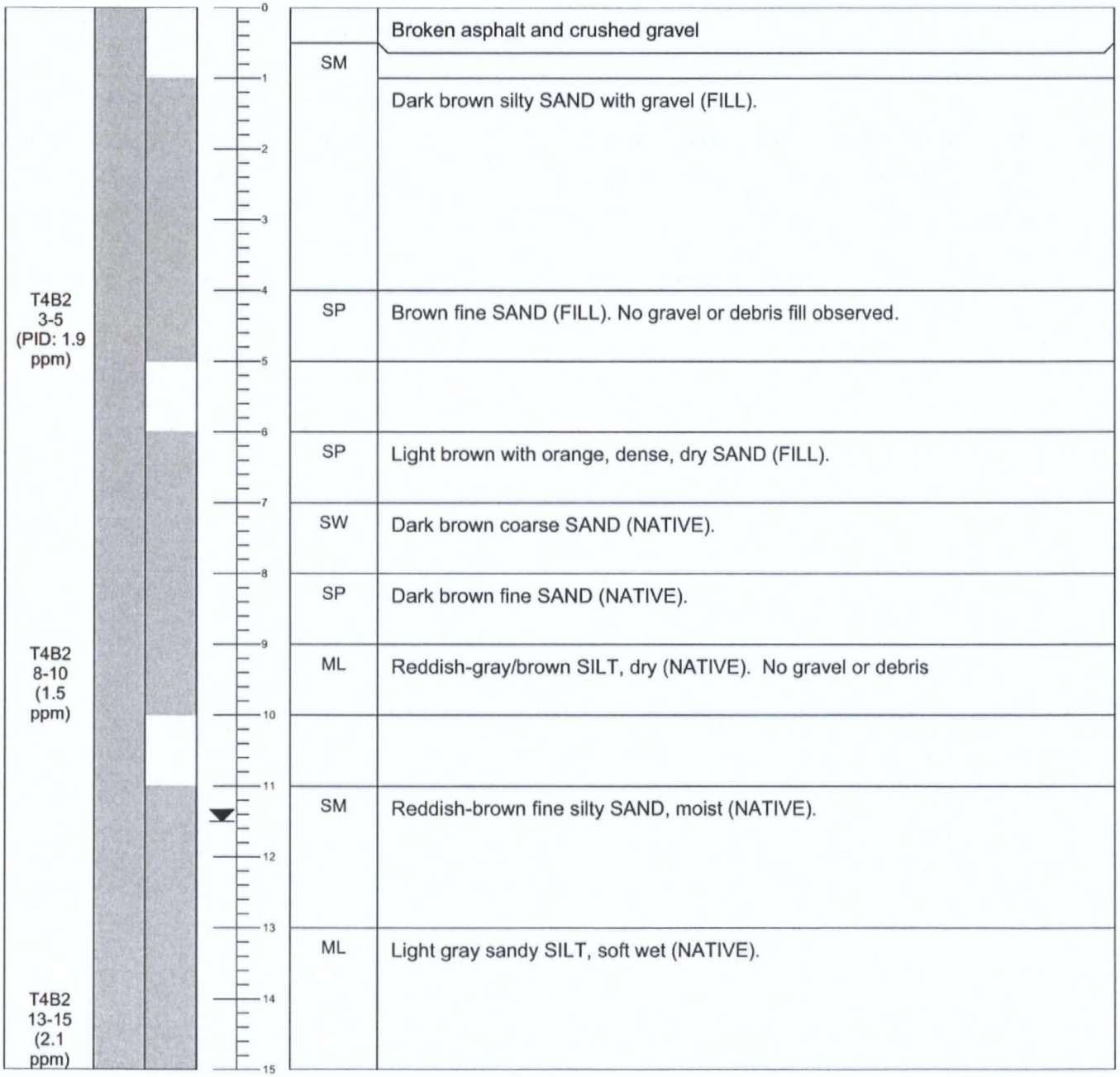
Boring ID: T4B2

Drill Date: January 14, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 11.5 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,745.3
Longitude/Easting: 1,275,858.1

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy



Notes:
FT BGS = Feet Below Ground Surface
= denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T4B3

Drill Date: January 14, 2011
Logged By: Lisa Meoli
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 12 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,755.6
Longitude/Easting: 1,275,828.2

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Crushed gravel and vegetation
		1	SM	Dark brown silty SAND (topsoil) with some vegetation and trace gravel.
		2		
		3		
		4	SP	Brown fine SAND, dry (FILL).
T4B3 3-5 (PID: 0.8 ppm)		5		
		6	SW	Dark brown coarse SAND, dry (FILL).
		7		
		8	ML	Light reddish-brown SILT, very stiff with trace fine sand, dry, oxidized (FILL?)
T4B3 8-10 (2.2 ppm)		9		
		10		
		11	SM	Reddish brown very fine silty SAND, saturated.
		12 ▼		
		13	ML	Gray SILT, soft, wet (NATIVE).
T4B3 13-15 (2.8 ppm)		14		
		15		

Notes:
FT BGS = Feet Below Ground Surface
▼ = denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

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Boring ID: T5B3

Drill Date: January 14, 2011
Logged By: Dean Brame
Drilled By: Cascade Drilling
Drill Type: Direct Push Geoprobe
Sample Method: direct push 2"x5' core
Boring Diameter: 2 inches
Boring Depth (ft bgs): 15 ft
Groundwater ATD (ft bgs): 9 ft

Coordinate System: State Plane, NAD83
Ground Surface Elevation: NA
Latitude/Northing: 195,715.3
Longitude/Easting: 1,275,855.9

Project: Jorgensen Forge PLO
Task: BP2-JFOS
Site Location: 8351 E. Marginal Way S., Seattle, WA

Remarks: weather rainy

SAMPLE Type/Depth	DRIVEN / RECOVERED	DEPTH (FT BGS)	USCS SYMBOL	SOIL DESCRIPTION AND OBSERVATIONS
		0		Topsoil and crushed gravel
		1	SW	Dark brown gravelly SAND, dry (FILL). Pale orange brick fragments 2.5 - 4 ft bgs.
		2		
		3		Light gray concrete at 3.5 ft bgs.
T5B3 3-5 (PID: 2.8 ppm)		4		
		5		Dark brown coarse SAND, moist (FILL).
		6		
		7		
		8		
		9	SP	
T5B3 8-10 (3.3 ppm)			SM	Brown to gray fine silty SAND, wet (FILL).
		10	CL	Dark gray silty CLAY, medium plasticity, wet (FILL?).
		11		
		12	SM	Dark grayish-brown fine sandy SILT, very wet (NATIVE).
		13		
T5B3 13-15 (2.8 ppm)		14	SP	Brown coarse SAND with orange mottling, wet (NATEIVE).
		15		

Notes:
FT BGS = Feet Below Ground Surface
= denotes start of water saturated soil
USCS = Unified Soil Classification System, modified from ASTM D2488

Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Appendix C
Video Survey Screenshots

Photo 1. Cores collected from 0–15 feet from Boring T1B1.

Photo 2. Cores collected from 0–15 feet Boring T1B2.

Photo 3. Cores collected from 0–20 feet from Boring T1B3.
Note poor recovery of some intervals.

Photo 4. Cores collected from 0–20 feet Boring T1B4.

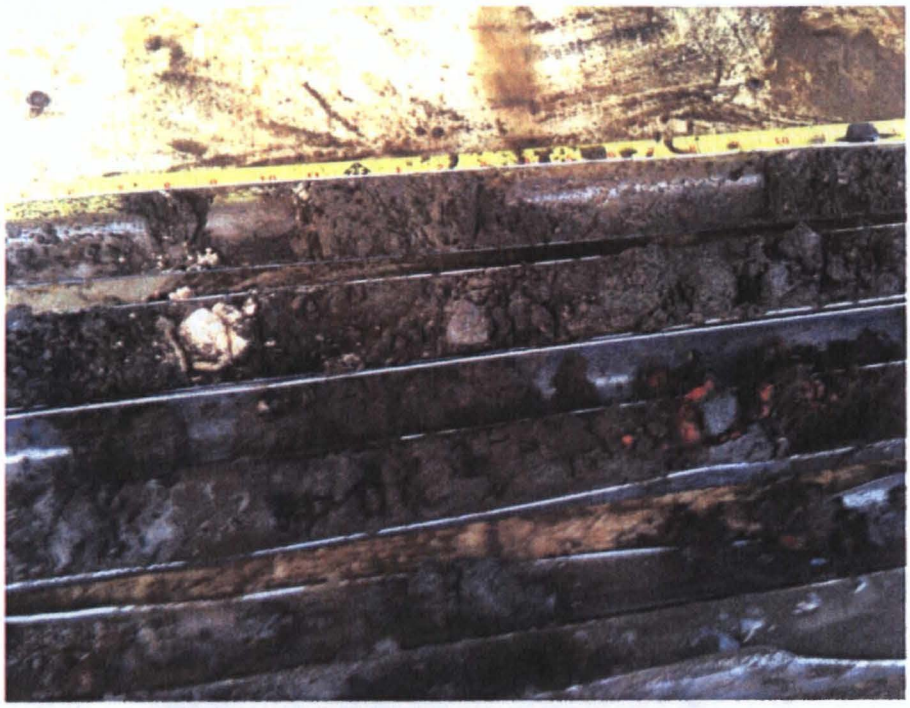

Photo 5. Cores collected from Boring 0–15 from T2B2. Note prevalence of debris fill.

Photo 6. Sheen noted in 16–20 foot interval core collected from Boring T2B4.

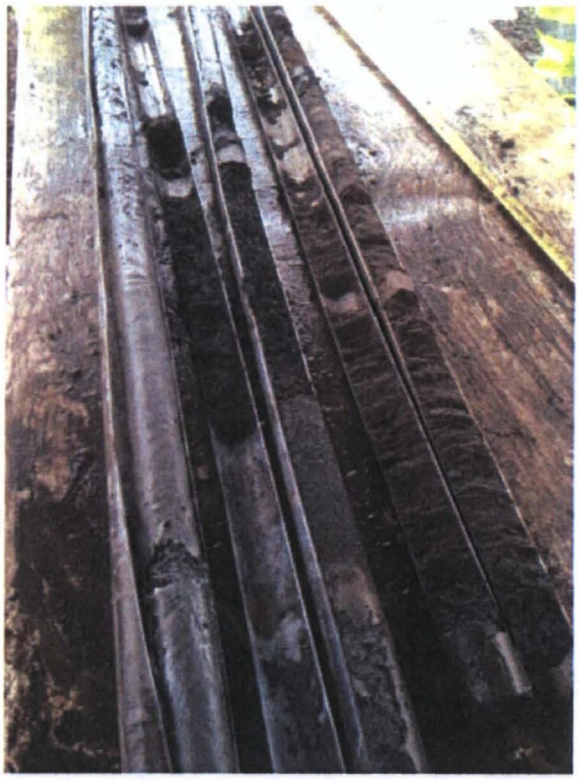

Photo 7. View of the three cores collected from 0–15 feet at Boring T3B1.

Photo 8. View of cores collected from 0–15 feet at Boring T3B2.

Photo 9. View of three spilt cores collected from Boring T3B3 from 0–15 feet.

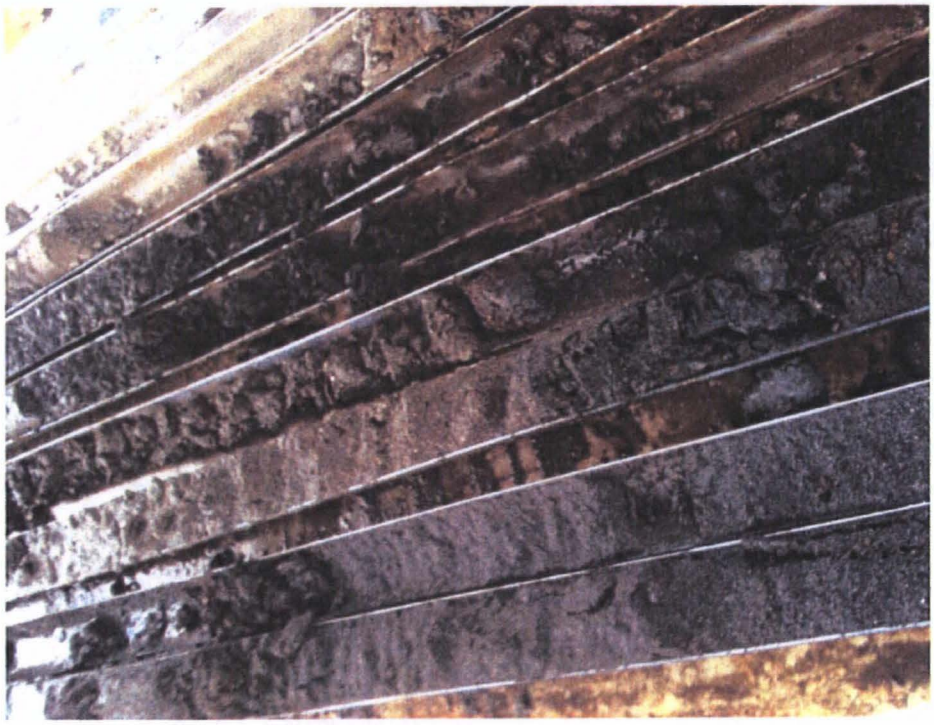

Photo 10. View of cores collected from Boring 5 to 25' feet at Boring T3B4.

Photo 11. Looking northwest toward Boring T2B3 with temporary screen installed. Geoprobe rig is positioned at Boring T2B4.

Photo 12. Looking north toward Geoprobe rig positioned at Boring T2B4.

Photo 13. Manhole solids sampling device.

Photo 14. Solids sample collected from public manhole.

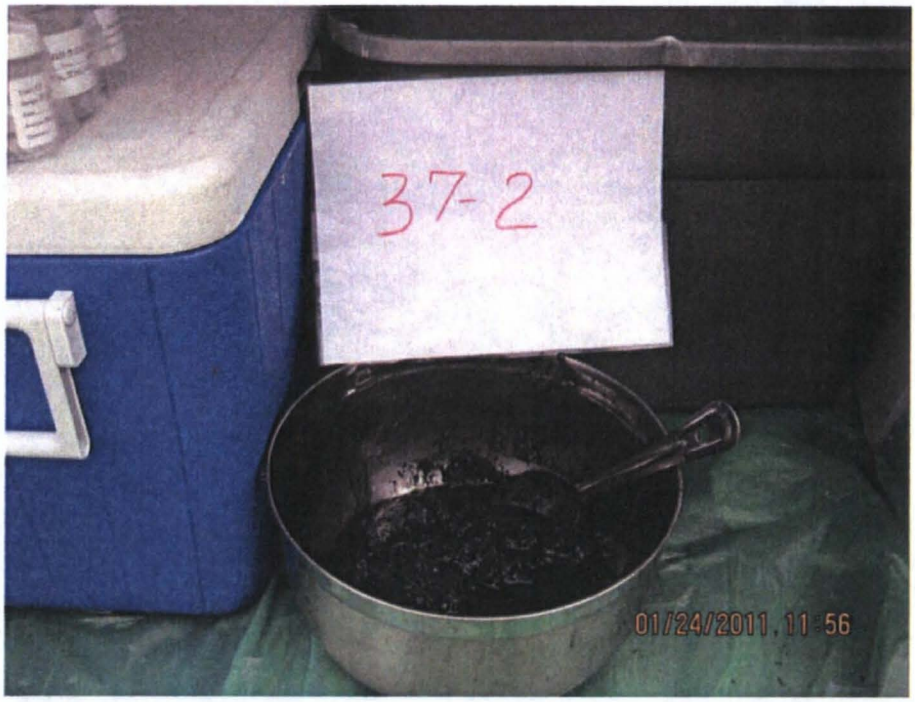

Photo 15. Solids sample from SDMH 37-2.

Photo 16. Solids sample collected from SDMH 37-7.

Photo 17. Solids sample collected from SDMH 24B.

Photo 18. Solids sample collected from SDMH 24A.

Photo 19. Solids sample collected from SDMH 15B.

Photo 20. Solids sample collected from SDMH 15A.

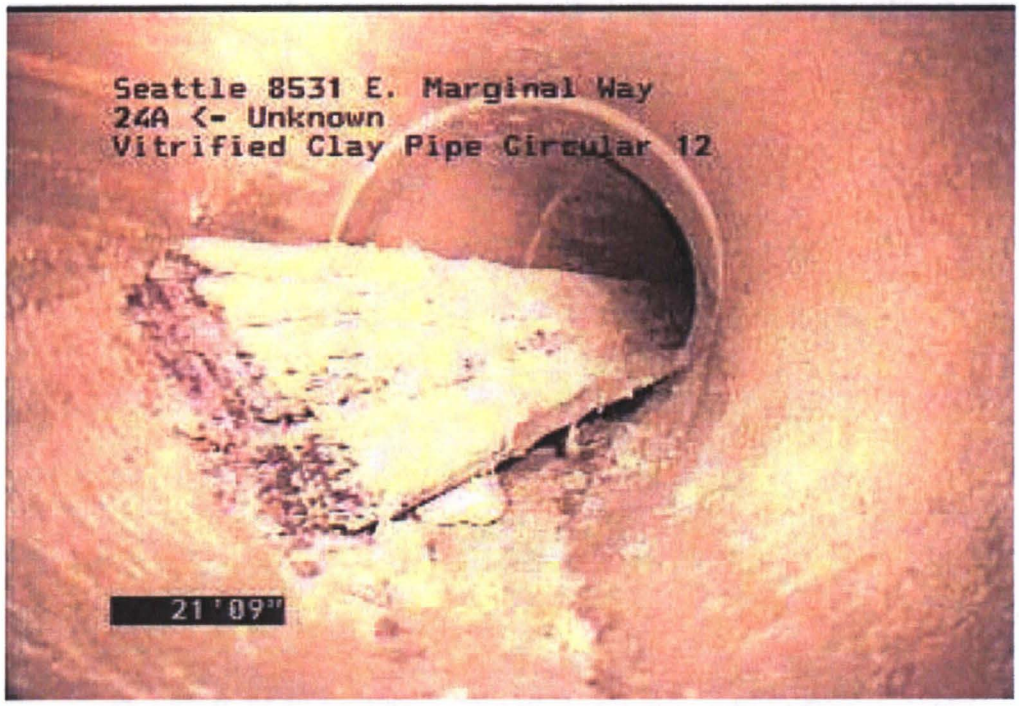

Photo 21. View of lumber in Jorgensen 10-inch Lateral, during pre-cleaning inspection, from approximately 22 feet upgradient from connection with 24-inch Pipe.

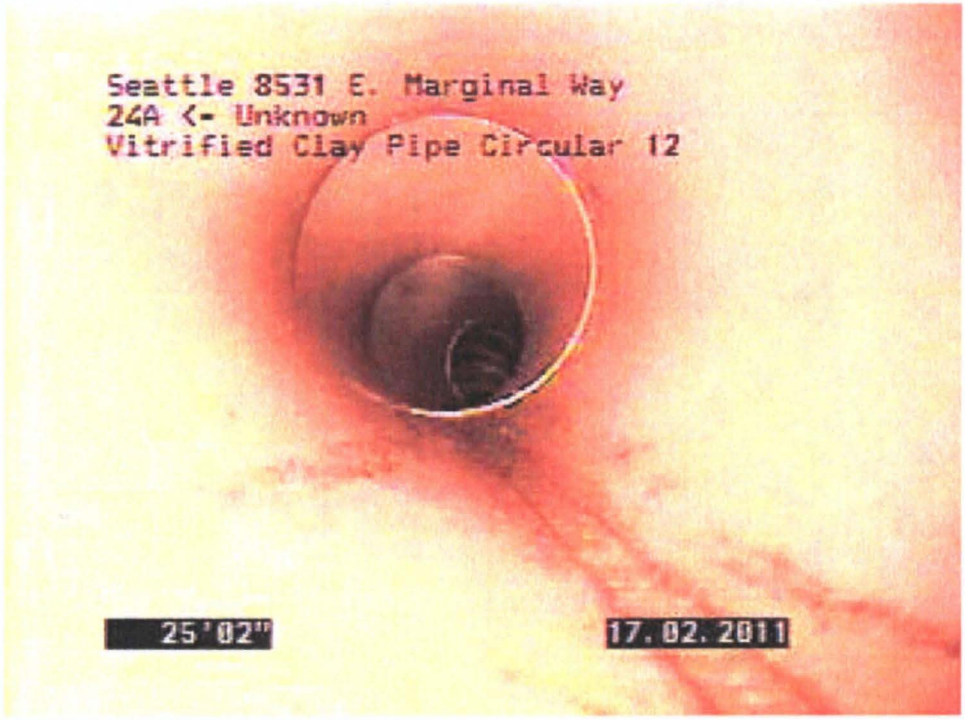

Photo 22. View of upgradient seal within Jorgensen 10-inch Lateral looking upstream from first bend in pipe, approximately 25 feet upgradient from connection to 24-inch Pipe.

Photo 23. View of SDMH 24A and 24-inch Pipe from surface.
(Photo taken during pre-cleaning inspection.)

Photo 24. Lumber retrieved from SDMH 24A February 18, 2011.
(Source: Anchor QEA, LLC 2011)

Photo 25. Lumber retrieved from Jorgensen 10-inch Lateral in black garbage bag placed in easternmost solid waste bin by subcontractor. Photo dated February 23, 2011.
(Source: Anchor QEA, LLC 2011)

Photo 26. Lumber retrieved from Jorgensen 10-inch Lateral scraped for sampling.

Photo 27. Scrapings of lumber retrieved from Jorgensen 10-inch Lateral collected for sample.

Photo 28. View of Jorgensen Visitor Parking Area 4-inch Lateral from within 24-inch Pipe during pre-cleaning video inspection.

Photo 29. Hydro-excavation of Jorgensen Visitor Parking Area 4-inch Lateral. Arrow indicates broken top of lateral.

Photo 30. Close up of broken top of Jorgensen Visitor Parking Area 4-inch Lateral (arrow). White pipe is irrigation line.

Photo 31. Excavation of Jorgensen Visitor Parking Area 4-inch Lateral backfilled with CDF.

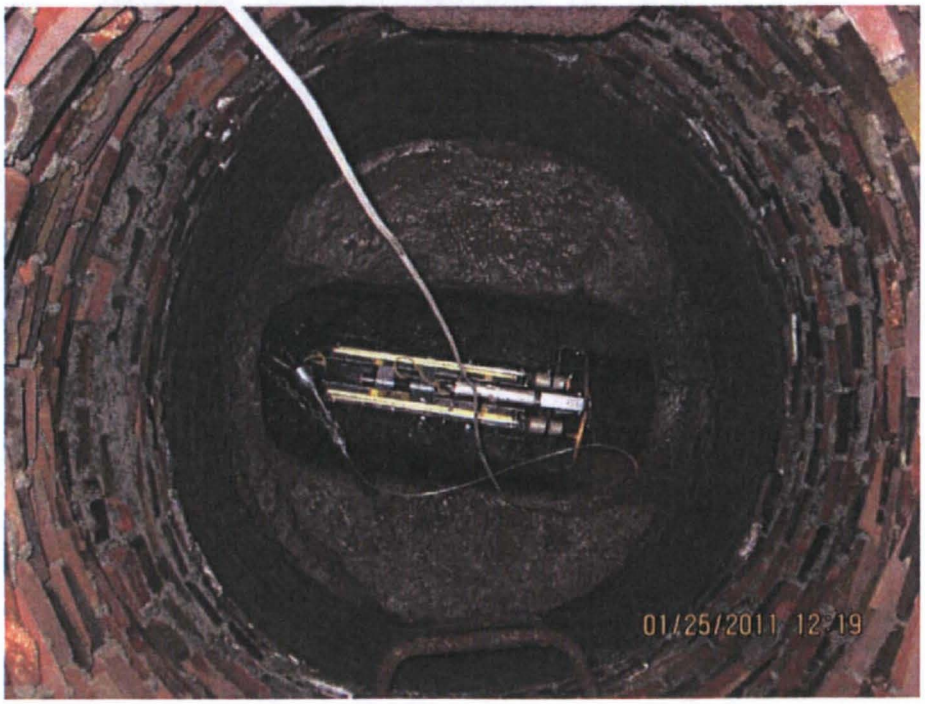

Photo 32. Camera used for pre-cleaning video inspection.

Photo 33. Camera positioned prior to entry for video inspection of Jorgensen 10-inch Lateral.

Photo 34. Camera equipment decontaminated using CAPSUR.

Photo 35. View of section of 12-inch Pipe removed at CMP transition and attachment of cleanout. East is to left.

Photo 36. Placement of seal in 12-inch Pipe at CMP transition. Photo taken looking west.

Photo 37. Placement of CDF in excavation at CMP transition of 12-inch Pipe.

Photo 38. Section of 24-inch Pipe removed at CMP transition.

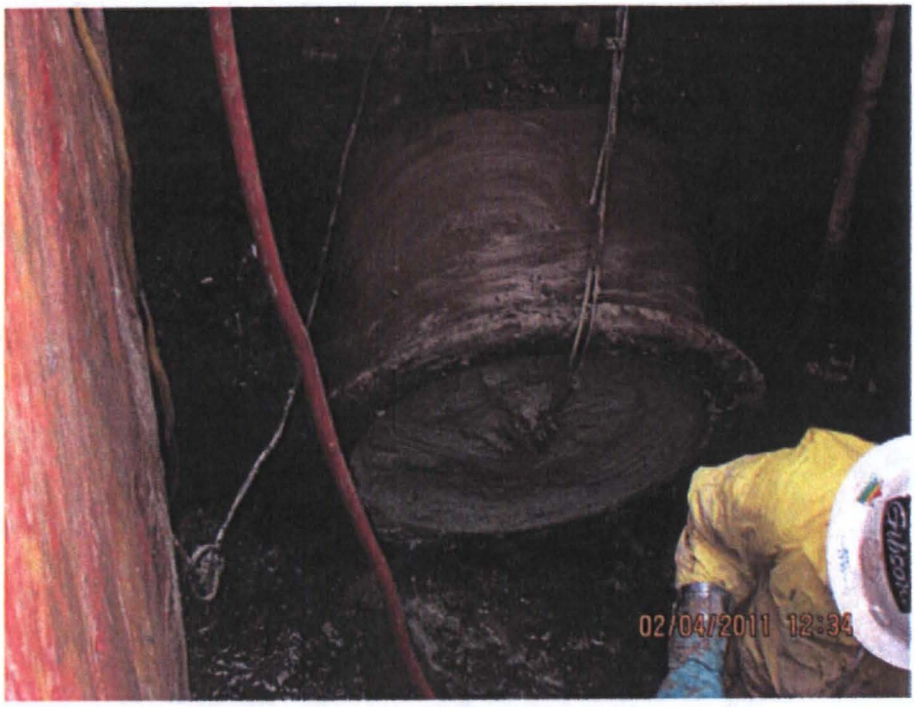

Photo 39. Seal in 24-inch Pipe at CMP transition.

Photo 40. View of seal and cleanout placed in 24-inch Pipe at CMP transition and backfilling excavation with CDF.

Photo 41. Measurement of 12-inch Pipe at SDMH 15A.

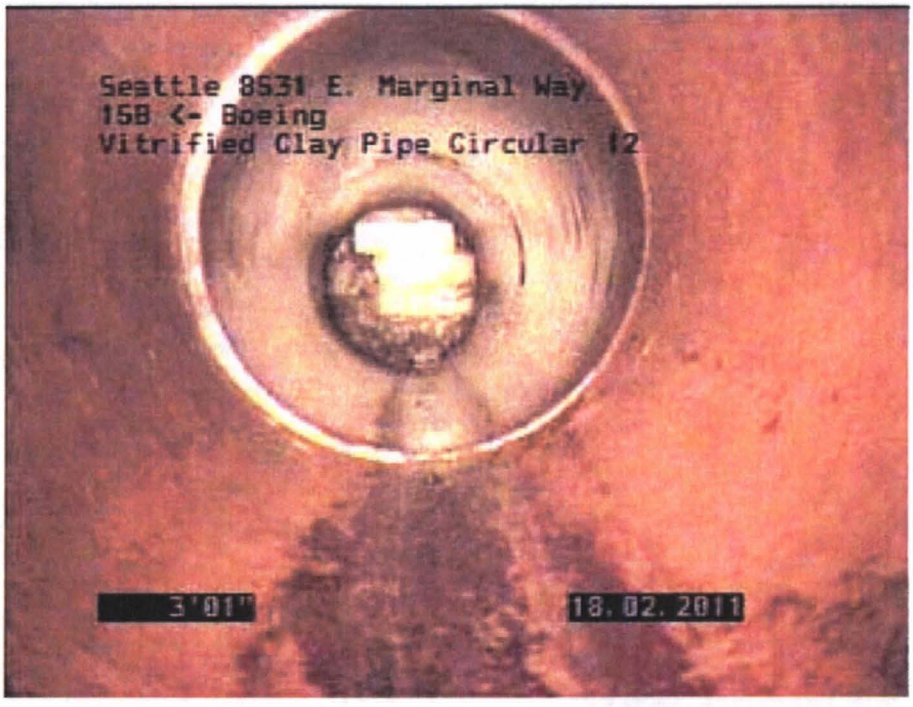

Photo 42. Post-cleaning view of existing upgradient seal of 12-inch Pipe from approximately 3 feet upgradient from SDMH 15B.

Photo 43. Pre-cleaning view looking downstream from approximately 3 feet downgradient from SDMH 15A.

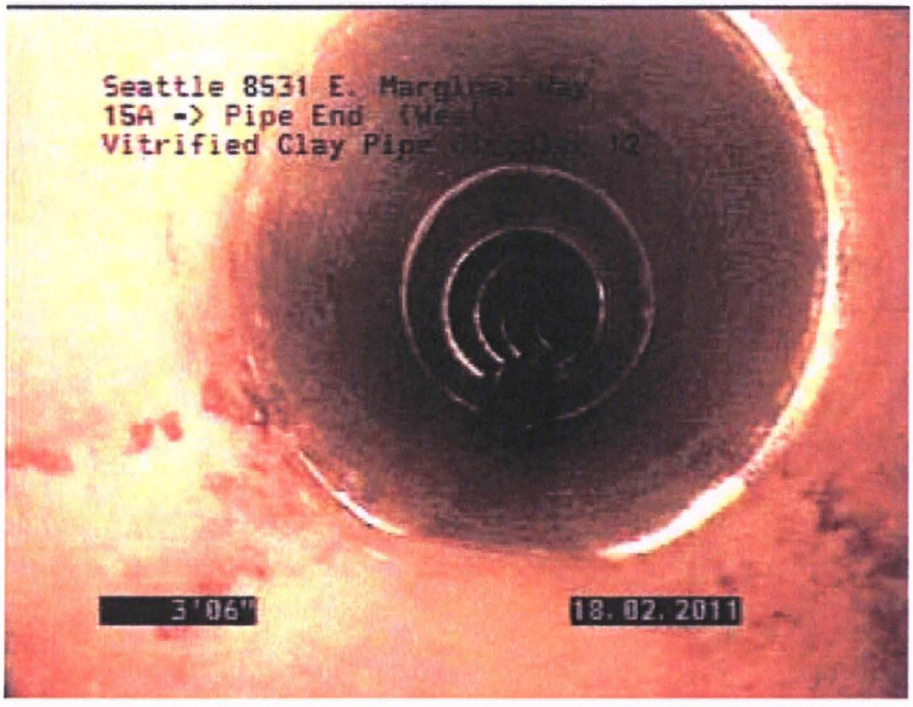

Photo 44. Post-cleaning view looking downstream from approximately 3 feet downgradient from SDMH 15A.

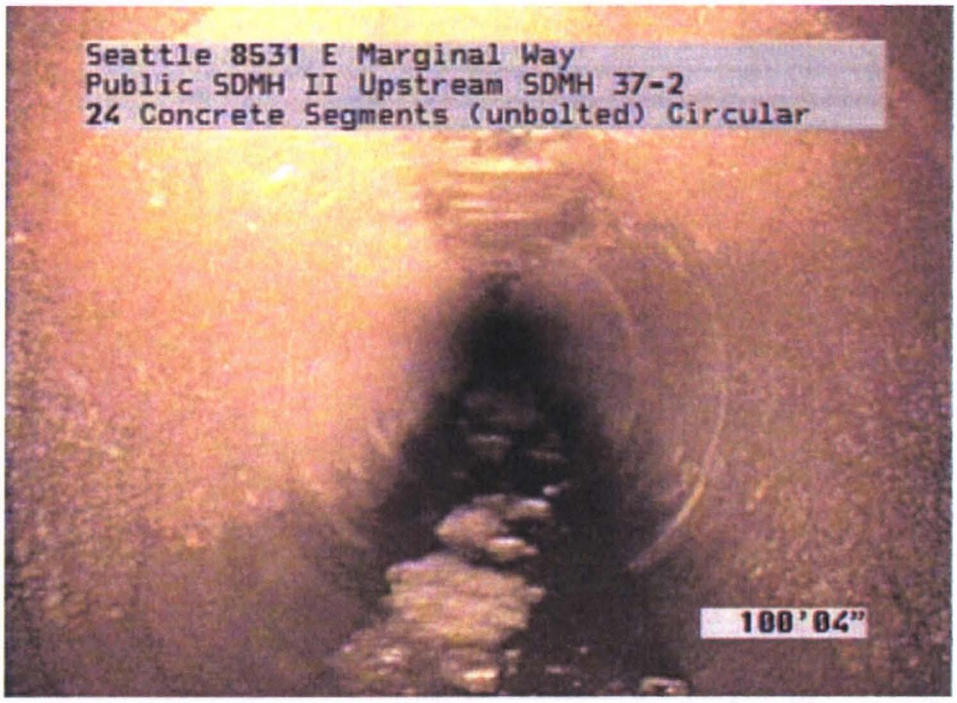

Photo 45. Pre-cleaning view of 24-inch Pipe looking upstream from approximately 100 feet upgradient of SDMH 37-2.

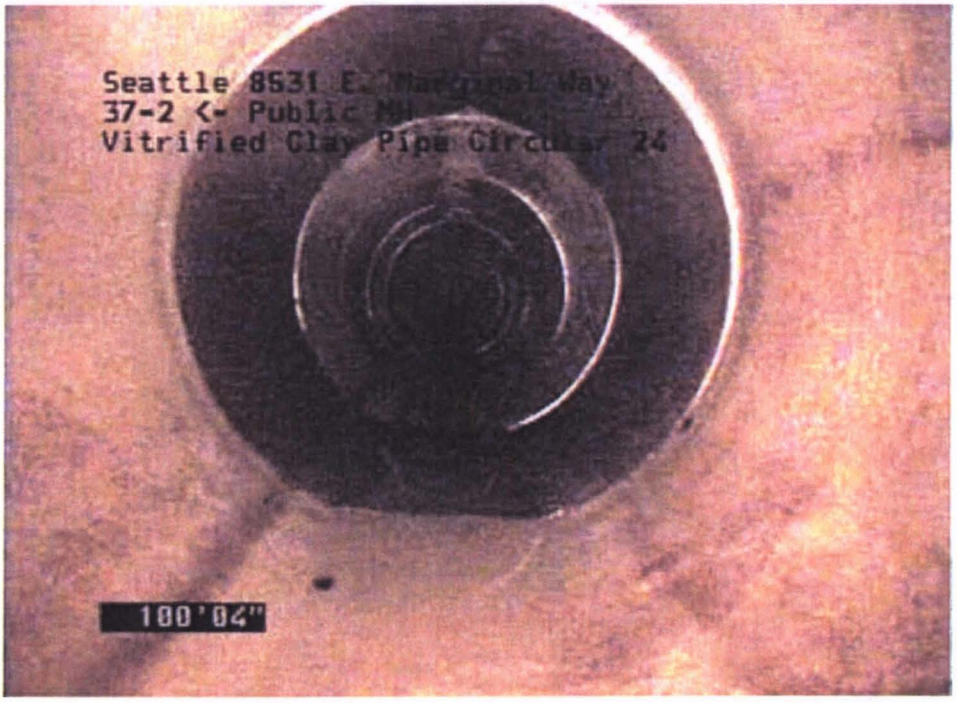

Photo 46. Post-cleaning view of 24-inch Pipe looking upstream from approximately 100 feet upgradient of SDMH 37-2.

Photo 47. Pre-cleaning view of 24-inch Pipe looking downstream from approximately 163 feet downgradient of SDMH 37.7.

Photo 48. Post-cleaning view of 24-inch Pipe looking upstream from approximately 2 feet upgradient of SDMH 24B.

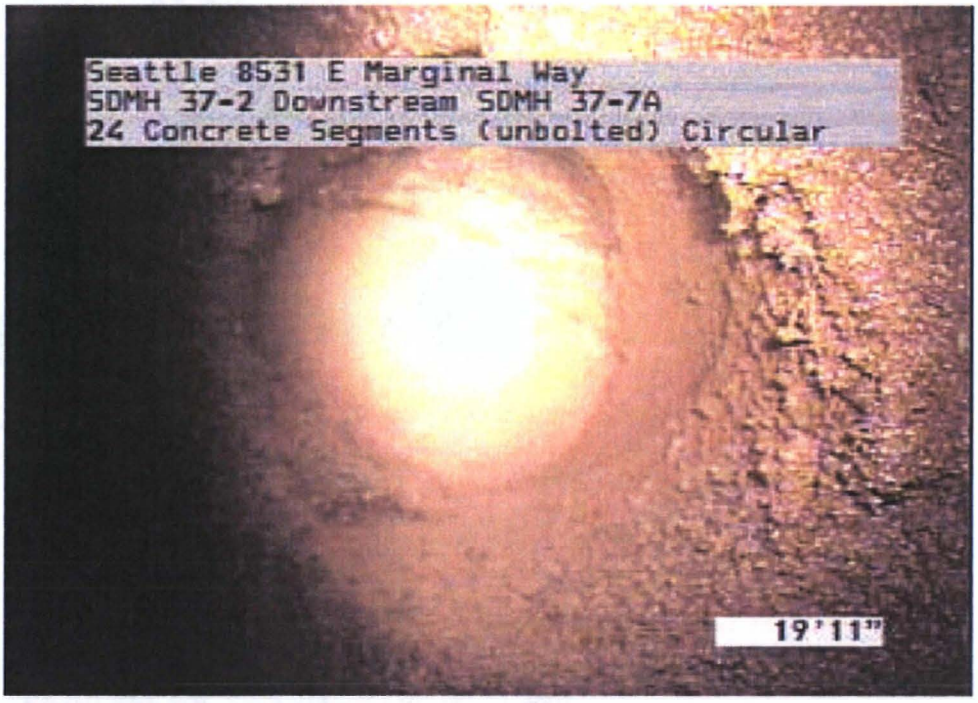

Photo 49. View of factory cap on Jorgensen office lateral during pre-cleaning inspection from approximately 19 feet downgradient of SDMH 37-2.

Photo 50. Pre-cleaning view of 24-inch Pipe looking downstream from approximately 200 feet downgradient of SDMH 24B.

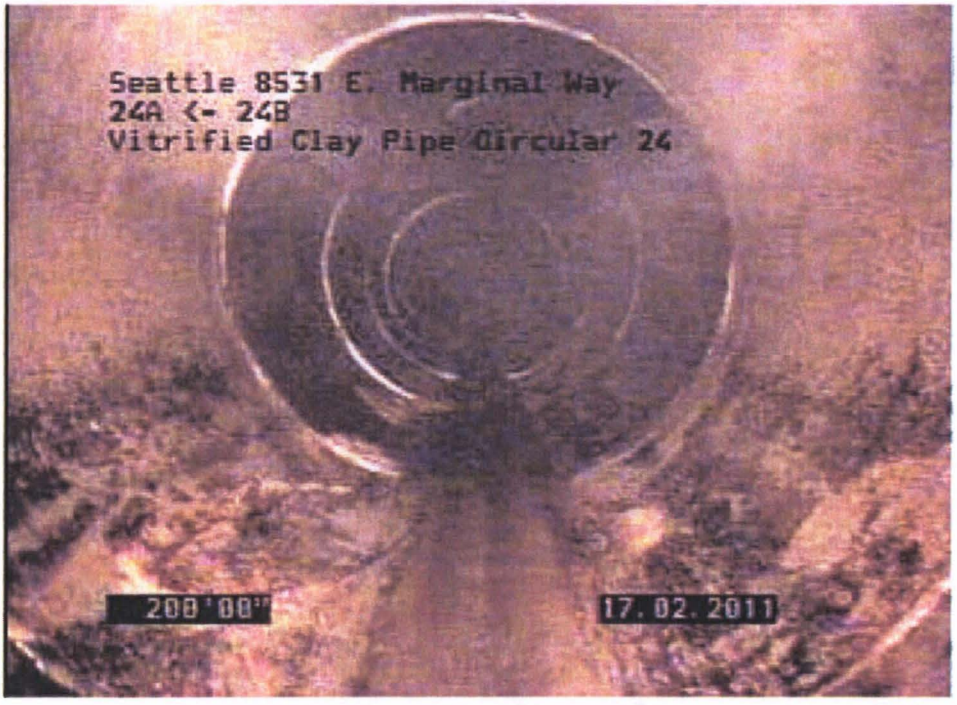

Photo 51. Post-cleaning view of 24-inch Pipe looking downstream from approximately 200 feet downgradient of SDMH 24B.

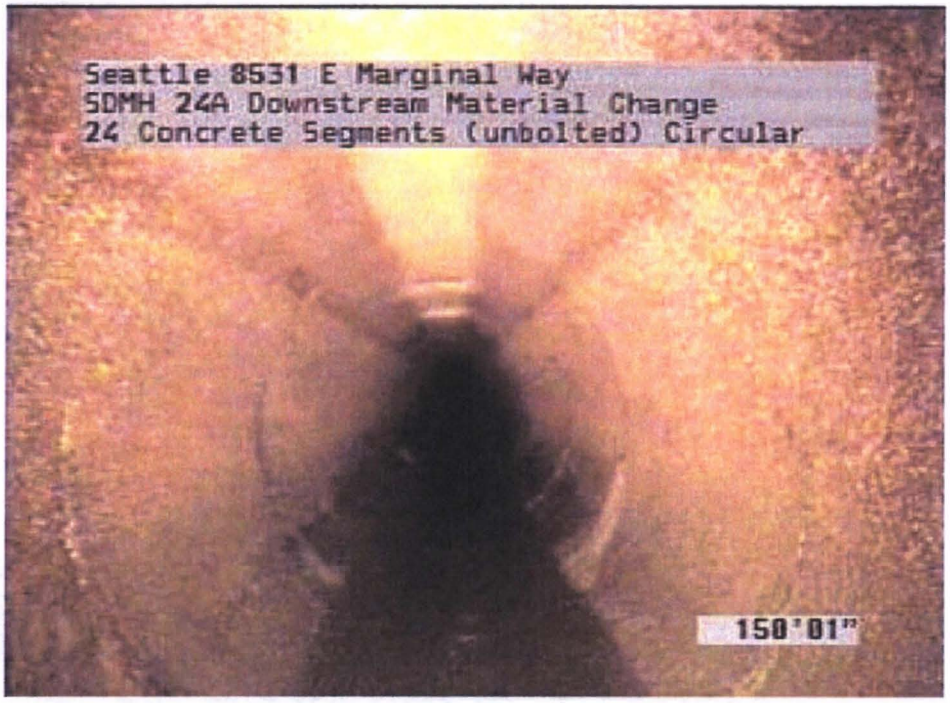

Photo 52. Pre-cleaning view of 24-inch Pipe looking downstream from approximately 150 feet downgradient of SDMH 24A.

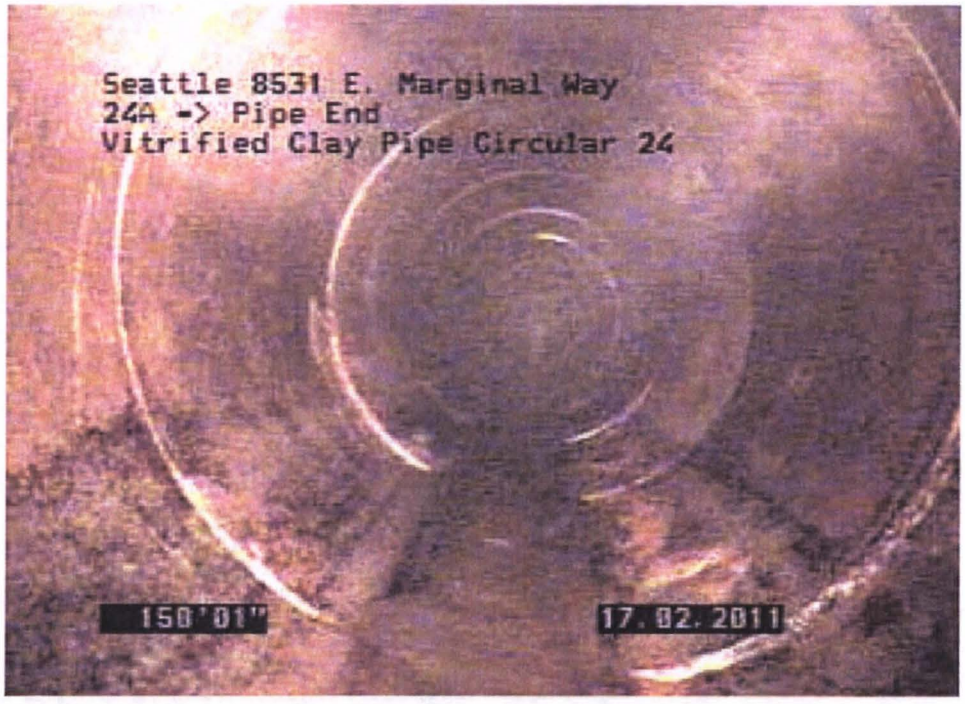

Photo 53. Post-cleaning view of 24-inch Pipe looking downstream from approximately 150 feet downgradient of SDMH 24A.

Photo 54. Pre-cleaning view of Jorgensen 10-inch Lateral looking upstream from approximately 5 feet upgradient from connection to 24-inch Pipe.

Photo 55. Post-cleaning view of Jorgensen 10-inch Lateral looking upstream from approximately 5 feet upgradient from connection to 24-inch Pipe.

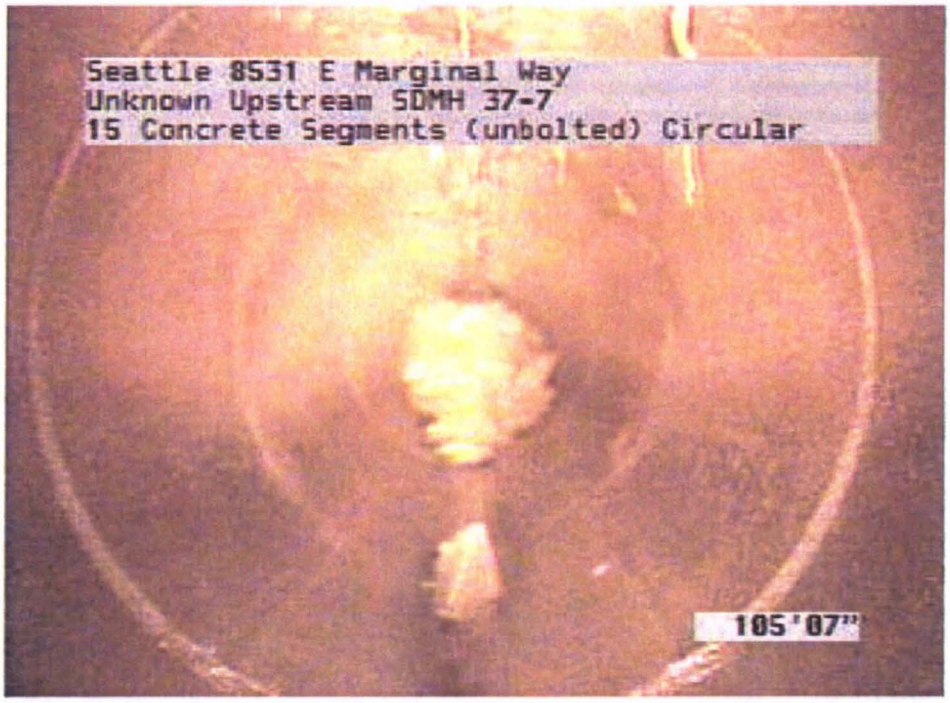

Photo 56. Pre-cleaning view of Boeing 15-inch Lateral looking upstream from approximately 10 feet from upgradient seal.

Photo 57. Post-cleaning view of Boeing 15-inch Lateral looking upstream from approximately 10 feet from upgradient seal.

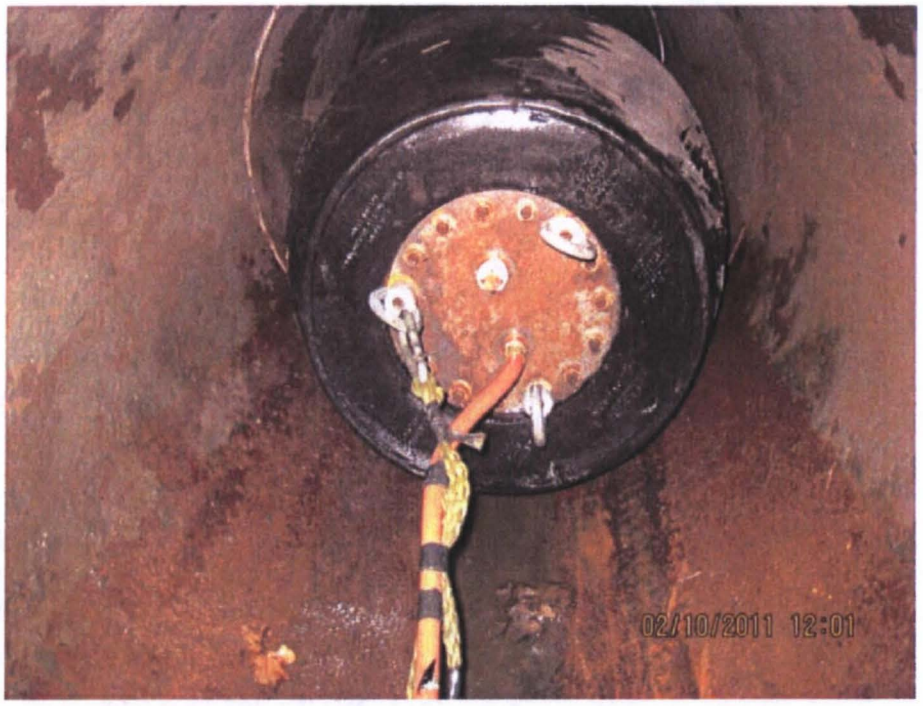

Photo 58. Temporary plug used during cleaning.

Photo 59. Installation of buoys for manhole sealing.

Photo 60. Manhole sealed with CDF.

Photo 61. Cleanouts at CMP transition sealed.

Photo 62. Jorgensen Visitor Parking Area 4-inch Lateral sealed with CDF prior to asphalt patching.

Photo 63. Temporary storage of material excavated from CMP transition.

Photo 64. View looking northwest at solid waste bins and water treatment system on Jorgensen Forge Property.

Photo 65. View of water treatment components.

Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Appendix D
Video Survey Inspection DVDs
(provided on DVD)

Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Appendix E
City of Tukwila Permit

City of Tukwila

Department of Public Works
6300 Southcenter Boulevard, Suite #100
Tukwila, Washington 98188
Phone: 206-433-0179
Fax: 206-431-3665
Web site: *http://www.ci.tukwila.wa.us*

PUBLIC WORKS CONSTRUCTION PERMIT

arcel No.: 0001600023
ddress: 8531 EAST MARGINAL WY S TUKW
ocation:

Permit Number: PW11-002
Issue Date: 02/02/2011
Permit Expires On: 08/01/2011

roject Name: JORGENSEN FORGE CORPORATION

Owner:
Name: **JORGENSEN FORGE CORP**
Address: C/O DOUG JAMES , 8531 E MARGINAL WAY S 98108

Contact Person:
Name: **AL SCHUMACHER BRAVO ENVIRONMENTAL** Phone: (425)424-9000
Address: 6437 SOUTH 144TH ST , TUKWILA WA 98168

Contractor:
Name: **BRAVO ENVIRONMENTAL NW INC** Phone: (425)424-9000
Address: 6705 NE 175TH ST , KENMORE WA 98028
Contractor License No: BRAVOEN911P9 Expiration Date: 11/04/2011

ESCRIPTION OF WORK:
LUGGING AND SEALING 24" STORM DRAIN AT PUBLIC MANHOLE
ND EXCAVATING, JETTING, CUUTING AND PLUGGING EXISTING 15" AND 24" STORM DRAIN PIPES AT THE END,
LLING MHs WITH CDF.
ORK TO BE DONE PER SEPTEMBER 30, 2010 US EPA REGION 10 OFFICE OF ENVIRONMENTAL CLEANUP ACTION
EMORANDUM FOR THE JORGENSEN-FORGE OUTFALL SITE.

alue of Construction: $0.00 Fees Collected: $7,006.00

ublic Works Activities:

hannelization / Striping:	N					
urb Cut / Access / Sidewalk / CSS:	N					
ire Loop Hydrant:	N	Number:	0		Size (Inches):	0
lood Control Zone:	N					
auling:	N	Start Time:			End Time:	
and Altering:	N	Volumes:	Cut 0 c.y.		Fill 0 c.y.	
andscape Irrigation:	N					
oving Oversize Load:	N	Start Time:			End Time:	
anitary Side Sewer:	N	Number:	0			
ewer Main Extension:	N	Private:	N		Public:	N
orm Drainage:	Y					
reet Use:	Y	Profit:	N		Non-Profit:	N
Vater Main Extension:	N	Private:	N		Public:	N
Vater Meter:	N					

Permit Center Authorized Signature: _____ Date: 02/02/11

I hereby certify that I have read and examined this permit and know the same to be true and correct. All provisions of law and ordinances governing this work will be complied with, whether specified herein or not.

The granting of this permit does not presume to give authority to violate or cancel the provisions of any other state or local laws regulating construction or the performance of work. I am authorized to sign and obtain this construction permit and agree to the conditions attached to this permit.

Signature: _____ Date: 2/02/11

Print Name: MIKE POMRIA

This permit shall become null and void if the work is not commenced within 180 days from the date of issuance, or if the work is suspended or abandoned for a period of 180 days from the last inspection.

PERMIT CONDITIONS

1: ***PUBLIC WORKS DEPARTMENT CONDITIONS***

2: The applicant shall call Public Works at 206 433-0179 minimum 24 hours in advance to schedule a pre-construction meeting with Public Works Project Inspector.
The applicant must notify the City Project Inspector at (206)433-0179 upon commencement and completion of work at least 24 hours in advance. All inspection requests for utility work must also be made 24 hours in advance.

3: Contractor shall notify Public Works Project Inspector at (206)433-0179 of commencement and completion of work at least 24 hours in advance.

4: Work affecting traffic flows shall be closely coordinated with the City Project Inspector. Traffic Control Plans shall be submitted to the Inspector for prior approval.

5: Permit is valid between the weekday hours of 7:00 a.m. and 3:30 p.m. only.

6: Flagging, signing and coning shall be in accordance with MUTCD for Traffic Control. Sweep or otherwise clean streets to the satisfaction of Public Works each night around your construction zone (No flushing allowed). Notify City Inspector before 12:00 Noon on Friday preceding any weekend work.

7: Any material spilled onto any street shall be cleaned up immediately.

8: Temporary erosion control measures shall be implemented as the first order of business to prevent sedimentation off-site or into existing drainage facilities.

9: The site shall have permanent erosion control measures in place as soon as possible after final grading has been completed and prior to the Final Inspection.

Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Appendix F
Analytical Reports
(provided on DVD)

Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Appendix G
Waste Disposal Documentation and Manifests

The Boeing Company
P.O. Box 3707
Seattle, WA 98124-2207

January 31, 2011
G-1241-YNG-012

DELIVERED BY EMAIL AND OVERNIGHT MAIL

Mr. Dan Duso
RCRA Compliance Inspector
Oregon Department of Environmental Quality
700 SE Emigrant, Suite 330
Pendleton OR 97804

Subject: Written Notification Regarding Shipment of Waste to Off-Site Facility

Dear Mr. Duso:

BOEING

Boeing is partnering with the Jorgensen Forge Corporation on a stormwater pipe source control project on the Duwamish Waterway south of Seattle, Washington. We are working under the direction of Mike Sibley, USEPA Emergency Response Group. This work is being done under an Agreed Order to removing PCB-containing solids from stormwater pipes. We intend to begin the source removal project within a few weeks and need your assistance with the following.

Per the requirements of the Order Section 21, Boeing/Jorgensen are required to provide written notification to your state of our intent to ship the waste from the project to a waste management facility in Oregon. An Order excerpt follows:

> *21. Off-Site Shipments.*
> *a. Respondents shall, prior to any off-Site shipment of Waste Material that is generated pursuant to this Order from the Site to an out-of-state waste management facility, provide written notification of such shipment of Waste Material to the appropriate state environmental official in the receiving facility's state and to the OSC. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards in a calendar year.*
>
> *i. Respondents shall include in the written notification the following information: 1) the name and location of the facility to which the Waste Material is to be shipped; 2) the type and quantity of the Waste Material to be shipped; 3) the expected schedule for the shipment of the Waste Material; and 4) the method of transportation. Respondents shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.*

The following provides the applicable information.

1) the name and location of the facility to which the Waste Material is to be shipped

Soils and solids (BULK):

CHEM. WASTE MGT - ARLINGTON
17629 CEDAR SPRINGS LANE
ARLINGTON, OR 97812
EPA ID: ORD089452353

2) the type and quantity of the Waste Material to be shipped-

BULK: Approximately 20 tons of solids will shipped - may be contaminated with PCBs and/or RCRA metals (pending characterization samples to be collected in late January)

3) the expected schedule for the shipment of the Waste Material

February 2011

BOEING

4) the method of transportation

BULK - Roll Off Boxes, transported by licensed hauler.

We believe provision of this information completes this Order requirement and that no further information needs to be provided in that regard. Please contact me with any questions.

Sincerely,

Y. Nicholas Garson, P.G.
Project Coordinator
Boeing EHS Environmental Remediation
P.O. Box 3707, Mail Code 9U4-26, Seattle WA; 98124-2207
425-269-7866
nick.garson@boeing.com;

cc: Mike Sibley, USEPA
Wayne Desberg, Jorgensen Forge Corporation
Mary Jo Donnelly, The Boeing Company

From: DUSO Dan
To: Garson, Nick
Subject: RE: Jorgensen Outfall Source Removal Project - Waste Disposal Notification
Date: Monday, January 31, 2011 12:26:25 PM

Nick,

The letter looks fine to me. I will make sure the letter is placed in our files.

Thanks
Dan

From: Garson, Nick [mailto:nick.garson@boeing.com]
Sent: Monday, January 31, 2011 12:21 PM
To: DUSO Dan
Cc: Sibley.Michael@epamail.epa.gov; Desberg,Wayne; Ed Berschinski; Donnelly, MaryJo
Subject: Jorgensen Outfall Source Removal Project - Waste Disposal Notification

Dan,

Please see the attached letter. I will send you a hard copy via overnight mail.

Please let me know if you have any questions.

Nick Garson, P. G.
Project Manager
Boeing EHS Remediation Group
Cell Phone 425-269-7866

From: DUSO Dan [mailto:DUSO.Dan@deq.state.or.us]
Sent: Wednesday, January 12, 2011 12:38 PM
To: Garson, Nick
Subject: RE: Jorgensen Outfall Source Removal Project - Waste Disposal Notification

Thanks Nick,

You can send the letter for my files to:

Oregon Department of Environmental Quality
700 SE Emigrant, Suite 330
Pendleton, OR 97801
Attention Dan Duso

From: Garson, Nick [mailto:nick.garson@boeing.com]

Sent: Tuesday, January 11, 2011 3:23 PM
To: DUSO Dan
Subject: Jorgensen Outfall Source Removal Project - Waste Disposal Notification

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From: Garson, Nick
Sent: Tuesday, January 11, 2011 3:15 PM
To: Dan Dusso (dusso.dan@deq.state.or.us)
Cc: 'Desberg,Wayne'; Ed Berschinski; 'Tom Colligan'; Donnelly, MaryJo; Ernst, William D; 'Sibley.Michael@epamail.epa.gov'
Subject: Jorgensen Outfall Source Removal Project - Waste Disposal Notification

Good afternoon Dan,

Thanks for contacting me yesterday. As we discussed, Boeing is partnered with the Jorgensen Forge Corporation on a stormwater outfall source removal project. We are working under the direction of Mike Sibley, USEPA Emergency Response Group and have initiated an Agreed Order to perform the work which consists of removing PCB-containing solids from stormwater pipes. We intend to begin the source removal project within a few weeks and need your assistance with the following.

Per the requirements of the Order Section 21, Boeing/Jorgensen are required to do the following:

21. Off-Site Shipments.
a. Respondents shall, prior to any off-Site shipment of Waste Material that is generated pursuant to this Order from the Site to an out-of-state waste management facility, provide written notification of such shipment of Waste Material to the appropriate state environmental official in the receiving facility's state and to the OSC. However, this notification requirement shall not apply to any off-Site shipments when the total volume of all such shipments will not exceed 10 cubic yards in a calendar year.

Respondents shall notify the state in which the planned receiving facility is located of major changes in the shipment plan, such as a decision to ship the Waste Material to another facility within the same state, or to a facility in another state.

Here's what we think we need to send you to comply with section 21 of the order. If you see anything else - please let me know.

1) the name and location of the facility to which the Waste Material is to be shipped;

Soils and solids (BULK):

CHEM. WASTE MGT - ARLINGTON
17629 CEDAR SPRINGS LANE

ARLINGTON, OR 97812
EPA ID: ORD089452353

Containers

BURLINGTON ENV. - KENT
20245 77TH AVE SO
KENT, WA 98032
EPA ID: WAD991281767

2) the type and quantity of the Waste Material to be shipped;

BULK

Approximately 20 tons of Solids - may be contaminated with PCBs and/or RCRA metals (pending characterization samples to be collected in late January)

3) the expected schedule for the shipment of the Waste Material;

February 2011

4) the method of transportation.

BULK - Roll Off Boxes

I will also send you this information in a follow up letter. What is your mailing address?

Thank you and please contact me if you have any questions.

Nick Garson, P. G.
Project Manager
Boeing EHS Remediation Group
Cell Phone 425-269-7866

411980

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	WAD009256819	1	800-424-9300	003443754 FLE

GENERATOR

5. Generator's Name and Mailing Address
THE BOEING CO. - PLANT 2
P.O. BOX 3707, (MC 8U4-20), SEATTLE, WA 98124
Generator's Phone: (425) 237-1933

Generator's Site Address (if different than mailing address)
7755 E. MARGINAL WAY S.,
SEATTLE, WA 98108

6. Transporter 1 Company Name: MP ENVIRONMENTAL SERVICES — U.S. EPA ID Number: CAT000624247

7. Transporter 2 Company Name — U.S. EPA ID Number:

8. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT
17629 CEDAR SPRINGS LANE, ARLINGTON, OR 97812
(541) 454-2643
Facility's Phone: — U.S. EPA ID Number: ORD089452353

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. RQ, UN3432, POLYCHLORINATED BIPHENYLS, SOLID, 8, PG II, RQ (POLYCHLORINATED BIPHENYLS)	1	C M	~~5,000~~ 4550 ~~4550~~ 5000	~~K~~ K	K002 PCB2
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
BTN=V0732, 1. Profile RXN000066-00, CHEMTREC# CCN22118 030 12-05-10 MDM.
MP Box #5453 4550K

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: JENNIFER A. PARSONS — Signature: Jennifer A. Parsons — Month 03 Day 14 Year 11

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. / Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Mark A Merritt — Signature: [signature] — Month 05 Day 14 Year 11

Transporter 2 Printed/Typed Name — Signature — Month Day Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☒ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Overchanged Total Qty - 3/14/11
Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H132			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Jamie Strand — Signature: [signature] — Month 3 Day 14 Year 11

WASTE MANAGEMENT

CHEMICAL WASTE MANAGEMENT OF THE NW
17629 Cedar Springs Lane
Arlington, OR 97812
(541) 454-2643
(541) 454-3279 Fax

BOEING COMPANY
WAD009256819
7755 E MARGINAL WAY S
SEATTLE WA 98108-4002

CERTIFICATE OF DISPOSAL

Chemical Waste Management of the Northwest, Inc., ORD089452353, has received the following waste material and certifies that the material has been landfilled in accordance with 40 CFR part 761 as it pertains to the land disposal of Polychlorinated Biphenyl contaminated materials.

GENERATOR:	BOEING COMPANY
MANIFEST #:	003443754FLE
LINE ITEM:	9b.1
PROFILE #:	RXN00066
CWM TRACKING ID:	411980-01
RECEIVED DATE:	03/14/11
DISPOSAL METHOD:	LANDFILL

DRUM #(S)	DISPOSAL DATE	DISPOSAL LOCATION
CCN22118	03/14/11	LANDFILL 14

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615) I certify that the information contained in or accompanying this document is true, accurate and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate and complete.

CWMNW RECORDS DEPARTMENT
Date 03/17/11

41979

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	WAD009256818	1	800-424-9300	003443753 FLE

GENERATOR

5. Generator's Name and Mailing Address
THE BOEING CO. - PLANT 2
P.O. BOX 3707, (MC 8U4-20), SEATTLE, WA 98124
Generator's Phone: (425) 237-1933

Generator's Site Address (if different than mailing address)
7755 E. MARGINAL WAY S.,
SEATTLE, WA 98108

6. Transporter 1 Company Name
MP ENVIRONMENTAL SERVICES
U.S. EPA ID Number
C A T 0 0 0 6 2 4 2 4 7

7. Transporter 2 Company Name
U.S. EPA ID Number

8. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT
17629 CEDAR SPRINGS LANE , ARLINGTON, OR 97812
Facility's Phone: (541) 454-2643
U.S. EPA ID Number
O R D 0 8 9 4 5 2 3 5 3

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. RQ, UN3432, POLYCHLORINATED BIPHENYLS, SOLID, 9, PG II, RQ (POLYCHLORINATED BIPHENYLS)	1	C M	9,000 2 D	Kg	1002 PCB%
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
BTN=V8733, 1. Profile RXN00006-00, CHEMTREC# CCN22118 OSP 12-05-10
MP Box # 5617
9344 K.

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: JENNIFER A. PARSONS
Signature: Jennifer A. Parsons
Month: 03 Day: 14 Year: 11

INTL

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: G SKEWIS
Signature:
Month: 03 Day: 14 Year: 11

Transporter 2 Printed/Typed Name:
Signature:
Month: Day: Year:

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Manifest Reference Number:

18b. Alternate Facility (or Generator)
U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator)
Month: Day: Year:

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H132			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Travis Strand
Signature:
Month: 3 Day: 14 Year: 11

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

CHEMICAL WASTE MANAGEMENT OF THE NW
17629 Cedar Springs Lane
Arlington, OR 97812
(541) 454-2643
(541) 454-3279 Fax

BOEING COMPANY
WAD009256819
7755 E MARGINAL WAY S
SEATTLE WA 98108-4002

CERTIFICATE OF DISPOSAL

Chemical Waste Management of the Northwest, Inc., ORD089452353, has received the following waste material and certifies that the material has been landfilled in accordance with 40 CFR part 761 as it pertains to the land disposal of Polychlorinated Biphenyl contaminated materials.

GENERATOR:	BOEING COMPANY
MANIFEST #:	003443753FLE
LINE ITEM:	9b.1
PROFILE #:	RXN00066
CWM TRACKING ID:	411979-01
RECEIVED DATE:	03/14/11
DISPOSAL METHOD:	LANDFILL

DRUM #(S)	DISPOSAL DATE	DISPOSAL LOCATION
CCN22118	03/14/11	LANDFILL 14

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615) I certify that the information contained in or accompanying this document is true, accurate and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate and complete.

CWMNW RECORDS DEPARTMENT
Date 03/17/11

A2225

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	WAD009256819	1	800-424-9300	003443763 FLE

GENERATOR

5. Generator's Name and Mailing Address
THE BOEING CO. - PLANT 2
P.O. BOX 3707, (MC 9U4-20), SEATTLE, WA 98124
Generator's Phone: (425) 237-1933

Generator's Site Address (if different than mailing address)
7755 E. MARGINAL WAY S.,
SEATTLE, WA 98108

6. Transporter 1 Company Name: MP ENVIRONMENTAL SERVICES — U.S. EPA ID Number: CAT000624247

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT
17629 CEDAR SPRINGS LANE , ARLINGTON, OR 97812
Facility's Phone: (541) 454-2643
U.S. EPA ID Number: ORD089452353

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. RQ, UN3432, POLYCHLORINATED BIPHENYLS, SOLID, 9, PG II, RQ (POLYCHLORINATED BIPHENYLS)	1	C M	~~9,000~~ 6033	~~P~~ K	8000 PCB
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information
BTN=V0933, 1. Profile RXN0006-00, CHEMTREC# CCN22118
R. 11 off #5637 OSD 2/7/11 D 4/4/11 per Kevin Lundberg/Clean Harbors 17300P

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: JENNIFER A. PARSONS — Signature: Jennifer A. Parsons — Month: 04 Day: 04 Year: 11

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name: Ed Biemold — Signature: Ed Biemold — Month: 4 Day: 4 Year: 11
Transporter 2 Printed/Typed Name — Signature — Month — Day — Year

DESIGNATED FACILITY

18. Discrepancy
18a. Discrepancy Indication Space ☒ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Driver changed Total Qty - D 4/4/11 OK per Kevin Lundberg/Clean Harbors
Facility's Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month — Day — Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H132			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a
Printed/Typed Name: Janice Stuard — Signature: Janice Stuard — Month: 4 Day: 4 Year: 11

WASTE MANAGEMENT

CHEMICAL WASTE MANAGEMENT OF THE NW

17629 Cedar Springs Lane
Arlington, OR 97812
(541) 454-2643
(541) 454-3279 Fax

BOEING COMPANY
WAD009256819
7755 E MARGINAL WAY S
SEATTLE WA 98108-4002

CERTIFICATE OF DISPOSAL

Chemical Waste Management of the Northwest, Inc., ORD089452353, has received the following waste material and certifies that the material has been landfilled in accordance with 40 CFR part 761 as it pertains to the land disposal of Polychlorinated Biphenyl contaminated materials.

GENERATOR:	BOEING COMPANY
MANIFEST #:	003443763FLE
LINE ITEM:	9b,1
PROFILE #:	RXN00066
CWM TRACKING ID:	412225-01
RECEIVED DATE:	04/04/11
DISPOSAL METHOD:	LANDFILL

DRUM #(S)	DISPOSAL DATE	DISPOSAL LOCATION
UN3432	04/04/11	LANDFILL 14

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615) I certify that the information contained in or accompanying this document is true, accurate and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate and complete.

CWMNW RECORDS DEPARTMENT
Date 04/08/11

412225

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Manifest Tracking Number
	WAD009256819	1	800-424-9300	003443763 FLE

GENERATOR

5. Generator's Name and Mailing Address

THE BOEING CO. - PLANT 2
P.O. BOX 3707, (MC 8U4-20), SEATTLE, WA 98124

Generator's Site Address (if different than mailing address)

7755 E. MARGINAL WAY S.,
SEATTLE, WA 98108

Generator's Phone: (425) 237-1933

6. Transporter 1 Company Name: MP ENVIRONMENTAL SERVICES — U.S. EPA ID Number: CAT000624247

7. Transporter 2 Company Name — U.S. EPA ID Number:

8. Designated Facility Name and Site Address — U.S. EPA ID Number:

CHEMICAL WASTE MANAGEMENT
17629 CEDAR SPRINGS LANE , ARLINGTON, OR 97812
Facility's Phone: (541) 454-2643 — ORD089452353

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Waste Codes
X	1. RQ, UN3432, POLYCHLORINATED BIPHENYLS, SOLID, 9, PG II, RQ (POLYCHLORINATED BIPHENYLS)	1	CM	4,000 LB 4033	P	X001 PCB's
	2.					
	3.					
	4.					

14. Special Handling Instructions and Additional Information

BTN=V0933, 1. Profile RXN000611-00, CHEMTREC# CCN22118

R.11 off #5637 OSD 2/7/11 D4/4/11 per Kevin Lundberg/Clean Harbors 17300P

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. If export shipment and I am the Primary Exporter, I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent.
I certify that the waste minimization statement identified in 40 CFR 262.27(a) (if I am a large quantity generator) or (b) (if I am a small quantity generator) is true.

Generator's/Offeror's Printed/Typed Name: JENNIFER A. PARSONS — Signature: Jennifer A. Parsons — Month: 04 Day: 04 Year: 11

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: Ed Biemold — Signature: Ed Biemold — Month: 4 Day: 4 Year: 11

Transporter 2 Printed/Typed Name — Signature — Month — Day — Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☒ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Driver changed Total Qty to D4/4/11 OK per Kevin Lundberg/Clean Harbors

Manifest Reference Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number:

Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month — Day — Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

1.	2.	3.	4.
H132			

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in Item 18a

Printed/Typed Name: Janice Stuard — Signature: Janice Stuard — Month: 4 Day: 4 Year: 11

EPA Form 8700-22 (Rev. 3-05) Previous editions are obsolete.

DESIGNATED FACILITY TO GENERATOR

WASTE MANAGEMENT

CHEMICAL WASTE MANAGEMENT OF THE NW
17629 Cedar Springs Lane
Arlington, OR 97812
(541) 454-2643
(541) 454-3279 Fax

BOEING COMPANY
WAD009256819
7755 E MARGINAL WAY S
SEATTLE WA 98108-4002

CERTIFICATE OF DISPOSAL

Chemical Waste Management of the Northwest, Inc., ORD089452353, has received the following waste material and certifies that the material has been landfilled in accordance with 40 CFR part 761 as it pertains to the land disposal of Polychlorinated Biphenyl contaminated materials.

GENERATOR:	BOEING COMPANY
MANIFEST #:	003443763FLE
LINE ITEM:	9b.1
PROFILE #:	RXN00066
CWM TRACKING ID:	412225-01
RECEIVED DATE:	04/04/11
DISPOSAL METHOD:	LANDFILL

DRUM #(S)	DISPOSAL DATE	DISPOSAL LOCATION
UN3432	04/04/11	LANDFILL 14

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615) I certify that the information contained in or accompanying this document is true, accurate and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate and complete.

CWMNW RECORDS DEPARTMENT
Date 04/08/11

King County
Wastewater Treatment Division
Industrial Waste Program
Department of Natural Resources and Parks
130 Nickerson Street, Suite 200
Seattle, WA 98109-1658
206-263-3000 Fax 206-263-3001
TTY Relay: 711

July 15, 2010

Michael L. Verhaar
Boeing Commercial Airplane – North Field
P.O. Box 3707, MC 67-74
Seattle, WA 98124

Letter of Authorization 11196-01 to Discharge to the Sanitary Sewer – Temporary PCB Pretreatment System

Dear Mr. Verhaar:

The King County Industrial Waste Program has reviewed your letter requesting authorization to discharge wastewater from the temporary stormwater polychlorinated biphenyl (PCB) washwater pretreatment system at Boeing Commercial Airplane - North Field located at 7500 East Marginal Way South, Seattle, Washington, to the sanitary sewer. In accordance with King County Code 28.84.060, King County grants approval for the discharge of up to 20,000 gallons per day (gpd) from July 19 through December 31, 2010, provided that:

- You notify the King County Industrial Waste Program when the discharge begins.
- You meet the discharge limitations, special conditions, monitoring and reporting requirements listed below.

Discharge Limitations

All PCB limits are per Aroclor. The detection limit for Aroclor analysis shall be no greater than 0.25 micrograms per liter (µg/L).

PCB (per Aroclor)	CAS Number	Discharge Limit		PCB (per aroclor)	CAS	Discharge Limit
Aroclor 1016	CAS 12674-11-2	1.0 µg/L		Aroclor 1248	CAS 12672-29-6	1.0 µg/L
Aroclor 1221	CAS 1104-28-2	1.0 µg/L		Aroclor 1254	CAS 11141-16-5	1.0 µg/L
Aroclor 1232	CAS 11141-16-5	1.0 µg/L		Aroclor 1260	CAS 11096-82-5	1.0 µg/L
Aroclor 1242	CAS 53469-21-9	1.0 µg/L		Aroclor 1262	CAS 37324-23-5	1.0 µg/L

There shall be no odor of solvent, gasoline, or hydrogen sulfide (rotten egg odor), oil sheen, unusual color, or visible turbidity. The discharge must remain translucent. If any of the discharge limits are exceeded, you must stop discharging and notify the King County Industrial Waste Program at 206-263-3000.

Special Conditions

Each batch of wastewater from this temporary PCB treatment system must be sampled after the treatment through granulated activated carbon and prior to discharge. Sample results must be obtained prior to discharge.

Monitoring Requirements

You shall conduct the following self-monitoring requirements for this discharge authorization:

Parameter	Frequency	Sample Type/Method
Discharge volume	Each batch	Pump estimate
PCBs (report per Aroclor)	Each batch	Grab

Reporting Requirements

A self-monitoring report (form enclosed) containing results of required self-monitoring and total volume discharged to the sewer shall be submitted to the King County Industrial Waste Program by the 15th of each month.

If you propose to increase the volume of your discharge or change the type or quantities of substances discharged, you must contact the King County Industrial Waste Program at least 60 days before making these changes.

Chapter 28.84 of the King County Code – Water Pollution Abatement sanctions a fee for each letter of authorization issued by the Department of Natural Resources and Parks. The fee for issuance of a letter of authorization in 2010 is $245. You will be sent an invoice for this amount.

If you have any questions about this authorization, or other questions about your wastewater discharge, please call me at 206-263-3028 or e-mail me at peggy.rice@kingcounty.gov. You may also wish to visit our program's Internet pages at www.kingcounty.gov/industrialwaste.

Sincerely,

Peggy Rice
Compliance Investigator

Enclosure

cc: Doris Turner, Boeing Commercial Airplane - North Field
Julie Howell, Seattle Public Utilities
Doug Hilderbrand, King County

King County

Industrial Waste Program
Discharge Monitoring Sheet

Company Name: Boeing Commercial Airplane - North Field
Location: 7500 East Marginal Way South, Seattle
Authorization No.: 11196-01

Your King County Industrial Waste Program Contact: Peggy Rice, 206-263-3028

Date	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Volume

Mail or FAX to:

King County Industrial Waste Program
130 Nickerson Street, Suite 200
Seattle, WA 98109-1658
206-263-3001 FAX

Turner, Doris S

From: Turner, Doris S
Sent: Monday, November 08, 2010 9:55 AM
To: 'Rice, Peggy'
Subject: Letter of Authorization 11196-01 , North Boeing Field Facility

Attachments: Letter_Authorization_11196-01_PCB_Trtmt_System.pdf

Peggy - We would like to extend the duration of the "Letter of Authorization 11196-01 to Discharge to the Sanitary Sewer - Temporary PCB Pretreatment System" at North Boeing Field issued July 15, 2010 to March 15, 2011. This extension will allow us to leave this temporary system at North Boeing Field rather than dismantle and relocate this system to the Plant 2 facility where we expect to process water from cleaning of approximately 27,000 lineal feet of storm sewer piping. I have attached your original "Letter of Authorization". We appreciate your assistance in this matter.

Letter_Authorizatio
n_11196-01_...

Doris Turner
Environmental Engineer
737 Airplane Program EHS
Phone: (425) 965-2304 ; Cell: (206) 650-7146
MC 67-74
e-mail: Doris.S.Turner@boeing.com

King County
Wastewater Treatment Division
Industrial Waste Program
Department of Natural Resources and Parks
130 Nickerson Street, Suite 200
Seattle, WA 98109-1658
206-263-3000 Fax 206-263-3001
TTY Relay: 711

November 22, 2010

Michael L. Verhaar
Boeing Commercial Airplane – North Field
P.O. Box 3707, MC 67-74
Seattle, WA 98124

Revision of Letter of Authorization 11196-02 for Temporary PCB Pretreatment System

Dear Mr. Verhaar:

The King County Industrial Waste Program has reviewed your November 8, 2010, letter requesting an extension of the letter of authorization issued on July 15, 2010, for discharges from the trucked waste operation at Boeing Commercial Airplane - North Field located at 7500 East Marginal Way South, Seattle, Washington, to the sanitary sewer. In accordance with King County Code 28.84.060, King County grants approval for the discharge of up to 20,000 gallons per day effective November 22, 2010, through July 15, 2011, provided that you meet the discharge limitations, special conditions, monitoring and reporting requirements listed below.

Discharge Limitations

All PCB limits are per Aroclor. The detection limit for Aroclor analysis shall be no greater than 0.25 micrograms per liter (µg/L).

PCB (per Aroclor)	CAS Number	Discharge Limit		PCB (per aroclor)	CAS	Discharge Limit
Aroclor 1016	CAS 12674-11-2	1.0 µg/L		Aroclor 1248	CAS 12672-29-6	1.0 µg/L
Aroclor 1221	CAS 1104-28-2	1.0 µg/L		Aroclor 1254	CAS 11141-16-5	1.0 µg/L
Aroclor 1232	CAS 11141-16-5	1.0 µg/L		Aroclor 1260	CAS 11096-82-5	1.0 µg/L
Aroclor 1242	CAS 53469-21-9	1.0 µg/L		Aroclor 1262	CAS 37324-23-5	1.0 µg/L

There shall be no odor of solvent, gasoline, or hydrogen sulfide (rotten egg odor), oil sheen, unusual color, or visible turbidity. The discharge must remain translucent. If any of the discharge limits are exceeded, you must stop discharging and notify the King County Industrial Waste Program at 206-263-3000.

Special Conditions

Each batch of wastewater from this temporary PCB treatment system must be sampled after the treatment through granulated activated carbon and prior to discharge. Sample results must be obtained prior to discharge.

Monitoring Requirements

You shall conduct the following self-monitoring requirements for this discharge authorization:

Parameter	Frequency	Sample Type/Method
Discharge volume	Each batch	Pump estimate
PCBs (report per Aroclor)	Each batch	Grab

Reporting Requirements

A self-monitoring report containing results of required self-monitoring and total volume discharged to the sewer shall be submitted to the King County Industrial Waste Program by the 15th of each month.

If you propose to increase the volume of your discharge or change the type or quantities of substances discharged, you must contact the King County Industrial Waste Program at least 60 days before making these changes.

There is no fee for this first revision of your authorization. However, future revisions that you request will be assessed the King County fee in effect at the time the revised Letter of Authorization is issued.

If you have any questions about this authorization, or other questions about your wastewater discharge, please call me at 206-263-3028 or e-mail me at peggy.rice@kingcounty.gov. You may also wish to visit our program's Internet pages at www.kingcounty.gov/industrialwaste.

Sincerely,

Peggy Rice

Peggy Rice
Compliance Investigator

Enclosure

cc: Julie Howell, Seattle Public Utilities
Doug Hilderbrand, King County

Christy Schmidt Wyborny

From: Rice, Peggy [Peggy.Rice@kingcounty.gov]
Sent: Thursday, March 17, 2011 4:23 PM
To: Turner, Doris S
Subject: RE: Plant2/Jorgensen Steel Storm Line Cleaning Water

Dear Doris;

King County has reviewed your March 9, 2011 email request to pretreat and discharge PCB contaminated wastewater generated from the storm sewer line cleaning project between the Plant 2 and the Jorgenson Steel Facility into and through the temporary PCB Treatment System located at the North Boeing Field facility. King County grants approval for this discharge for up to 20,000 gallons per day. This wastewater is regulated under of Letter of Authorization 11196-02 issued to Boeing on November 22, 2010. Discharge limitations, special conditions, monitoring and reporting requirements of Letter of Authorization 11196-02 shall be adhered to.

There is no fee for this approval.

If you have any questions, please contact me.

Sincerely,

Peggy Rice
KC Industrial Waste Pretreatment Program
206-263-3028
peggy.rice@kingcounty.gov
http://www.kingcounty.gov/environment/wastewater/industrialwaste.aspx

-----Original Message-----
From: Turner, Doris S [mailto:doris.s.turner@boeing.com]
Sent: Wednesday, March 09, 2011 6:59 AM
To: Rice, Peggy
Subject: Plant2/Jorgensen Steel Storm Line Cleaning Water

Peggy - We recently completed a storm sewer line cleaning project between the Plant 2 and the Jorgensen Steel Facility. Approximately 36,000 gallons of water was collected in 3 Baker tanks during the project. The water was analyzed and the results are in the attached file sk67.pdf . The PCB levels of Aroclor 1254 in this water was above the 1ppb limit required for discharge by King County. All other parameters met King County discharge limits. We propose transferring this water to our North Boeing Field Facility and processing it through the Temporary PCB Treatment System under the "Letter of Authorization 11196-01" issued by King County on July 15, 2010.- I have also attached this document.
We request King County's approval to transfer this water to our North Boeing Field facility for treatment and discharge to the sanitary sewer system. We appreciate you assistance in this matter.

If you have any questions or concerns please feel free to contact me.

Doris Turner
Environmental Engineer

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Jorgensen Forge Outfall Site
Seattle, Washington

Source Control Action Completion Report

Appendix H
Quality Assurance Memoranda

BOEING COMPANY – JORGENSEN FORGE OUTFALL SITE
SEATTLE, WASHINGTON
LINE SOLIDS SAMPLING - WINTER OF 2011
DATA VALIDATION QA/QC REVIEW

INTRODUCTION

A total of ten catch basin solids samples, one rinsate blank, and a decontamination or a rinsate water sample were collected January 24 and February 25 of 2011. This sampling was conducted as part of the property line pipes cleanout action according to the *Source Control Action - 15-inch and 24-inch Pipes Cleanout Work Plan (Floyd|Snider, 2010).* Samples were analyzed by Analytical Resources Incorporated (ARI) of Tukwila, Washington for the following parameters:

- Polychlorinated biphenyls (PCBs) by USEPA 8082
- Diesel and Extended Range by Washington State Department of Ecology NWTPH-Dx
- Semivolatile Organic Compounds (SVOCs) by USEPA Method 8270D
- Metals (Arsenic, Cadmium, Copper, Lead, Nickel, and Zinc) by USEPA Method 6010.
- TCLP Metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver) by USEPA Methods 1311/6010/7470A.

Samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (USEPA SW-846)* and *Washington State Department of Ecology Methods for Petroleum Hydrocarbon Analysis*.

Samples were analyzed and results reported by the laboratory in batch numbers as summarized below:

SDG SG07/SJ49 (PCBs, SVOCs, Diesel and Extended Range, Metals and TCLP Metals):

JF-PLSD-PS-15A	JF-PLSD-PS-37-7	JF-PLSD-PS-37-7-M
JF-PLSD-PS-15B	JF-PLSD-PS-37-2	JF-PLSD-PS-TCLP
JF-PLSD-PS-24A	JF-PLSD-PS-PUBLIC	
JF-PLSD-PS-24B	JF-PLSD-PS-24B-D	

SDG SJ56 (PCBs):

JF-PLSD-RJW-4L

Quality assurance/quality control (QA/QC) reviews of laboratory data were performed in the laboratory in accordance with the laboratory quality assurance program plan. The data validation QA/QC review focused primarily on laboratory result summary sheets and quality control summary sheets to ensure that work plan data quality objectives were met for the project. Data validation was conducted in accordance with the criteria outlined in the National Functional Guidelines for Organic Data Review (EPA 1999 and 2008) and the National Functional Guidelines for Inorganic Data Review (EPA 2004), modified to include method specific requirements of the laboratory analytical methods.

For work involving the cleanout of the property line pipes, the validation level specified in the Work Plan and Appendix B Sampling Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) of the *Source Control Action - 15-inch and 24-inch Pipes Cleanout Work Plan (Floyd|Snider, 2010)* is a Level 1, which is considered a basic review. Qualified results (referred to in the Work Plan as external data validation qualifiers) were added by the data validator to electronic data deliverables (EDD). The following data requirements were evaluated:

- Package completeness
- Sample identifications and reported analyses match the Chain-of-Custody Form
- Sample holding times and sample preservation
- Verification that the required detection limits and reporting limits have been achieved.
- Verification that the field duplicates, matrix spike/ matrix spike duplicate samples (MS/MSDs), and laboratory control samples were analyzed at the proper frequency.
- Matrix spike recoveries
- Laboratory control sample recoveries
- Surrogate recoveries (organics only)
- Laboratory method blanks
- Rinsate blank

CASE NARRATIVE COMMENTS

Review of the cover letters associated with the Sample Delivery Groups (SDGs) indicates multiple analytical issues for SDG SG07. These are addressed in appropriate sections of this report. The following summarizes data anomalies or discrepancies noted in the case narratives:

SDG SG07: Issues with PCB surrogate recovery and matrix spike recoveries. Refer to PCB section for more details.

SDG SG07: Issues with SVOC method blank contamination, SVOC surrogate recoveries, SVOC continuing calibrations, SVOC internal standard, and SVOC matrix spike recovery. Refer to SVOC section for more details.

SDG SG07: Issues with diesel matrix spike recovery. Refer to Diesel section of this report for more details.

SDG SG07: Issues with metals matrix spike recovery and the TCLP method blank is contaminated. Refer to Metals section for more details.

SDG SJ49: Selected samples from SDG SG07 were put on hold by Floyd|Snider pending further instructions. These samples (7) were submitted for TCLP metals analysis on February 23, 2011 and reported by ARI on February 23 of 2011.

SDG SJ56: A soil and a water were collected and submitted. Standard turnaround analysis request was made for the soil sample. ARI logged the soil under a different ARI SDG. The water sample (Sample JF-PLSD-RJW-4L) was analyzed for PCBs as requested within a 2-day turnaround. Results for the Sample (Sample JF-PLSD-RJW-4L) are reviewed in this data validation report.

SAMPLE CUSTODY, SAMPLE RECEIPT, and PRESERVATION

Chain of custody (COC) record, laboratory analysis request, cooler receipt forms, and other documentation (i.e. preservation verification form) were reviewed. Samples were received by ARI Laboratory in good condition with the following discussion:

SDG SG07: Cooler temperature was received by the laboratory at 6.6°C slightly above the National Functional Guideline recommended temperature of 2°C to 6°C. No action was taken since the samples were collected and delivered to ARI on the same day. Samples did not have sufficient time to cool.

REPORTING CRITERIA

In certain cases the laboratory performs dilutions, re-extractions, and/or re-analyses and reports multiple sample results on an analytical parameter. These data are considered useful however it should be noted that database results reflect ONLY one result for each sample. The data user should be aware that decision criteria used to report these results in these cases typically are as follows:

1) If the analyte exceeds the calibration range, then the diluted result is selected;
2) If an analyte is detected in both runs, then the higher concentration is selected from the two runs (more conservative);
3) If an analyte is detected in one run, but not the other, then the detection (more conservative) is selected;
4) If the analyte is not detected in either run, the lower reporting limit is selected.

It should be noted that there are some exceptions to the decision criteria listed above but in these cases the selected result will be clearly identified (and the reasons for doing so) for the data user.

SEMIVOLATILE ORGANIC COMPOUNDS

The laboratory provided a complete Level 1 data package for the SVOC analyses. The items reviewed during validation are summarized below. It should be noted that case narrative notes included discussions on calibration and internal standard issues which is outside a typical Level 1 review. Associated results are qualified accordingly.

Analytical Methods: Samples for SVOC analysis were analyzed by gas chromatography/mass spectrometry (GC/MS) using USEPA Method 8270D, in accordance with the method specified in the SAP/QAPP.

Sample Holding Times: All samples were extracted within 14 days of sample collection and analyzed within 40 days from the date of extraction to analysis with the following exception:

SDG SG07: Sample JF-PLSD-PS-15B was re-extracted one day past the recommended holding time of 14 days. No action was taken as this is a minor holding time exceedance.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussions:

The SAP/QAPP specifies a reporting limit range for SVOCs and is not compound specific.

SDG SG07: ARI reported initial run results and diluted run results for Samples JF-PLSD-PS-15A, JF-PLSD-PS-24B, and JF-PLSD-PS-37-7-M. Soil sample JF-PLSD-PS-15A SVOC compounds bis(2-ethylhexyl) phthalate (DEHP) and butylbenzylphthalate (BBP) were qualified as "ES" by ARI to indicate that the concentration of the target analyte exceeded the instrument calibration range and saturated the detector. The data validator qualified DEHP and BBP results in the initial run for sample JF-PLSD-PS-15A as Do Not Report (DNR). Refer to diluted sample re-analysis for DEHP and BBP results. Refer to Reporting Criteria discussion above for guidance on selection of other SVOC results from the initial run versus the diluted run.

The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

Calibration and Internal Standard Issues: Case narrative notes indicate the following:

SDG SG07: SVOC continuing calibration (CCAL) data for 2/4/11 and 2/8/11 show high recovery (above acceptance criteria) for compounds indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene. No action was taken in this case since there were no detections of these analytes in associated samples.

SDG SG07: SVOC CCAL data for 2/7/11 show high recovery (above acceptance criteria) for compounds 4-nitrophenol, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene. As a result all samples with positive detections for these analytes are "Q" qualified by ARI to indicate that the "detected analyte does not meet established acceptance criteria". Associated samples (JF-PLSD-PS-15B, JF-PLSD-PS-24B, JF-PLSD-PS-37-7, JF-PLSD-PS-37-2, JF-PLSD-PS-PUBLIC, JF-PLSD-PS-24B-D, JF-PLSD-PS-37-7-M and JF-PLSD-PS-37-7-M DILUTION) with 4-nitrophenol, dibenzo(a,h)anthracene, and benzo(g,h,i) perylene detections were qualified as estimated (J) by the data validator.

SDG SG07: SVOC CCAL data for 2/10/11 show high recovery for compounds 4-nitroaniline and 4-nitrophenol. No action was taken in this case since there were no detections of these analytes in associated samples.

SDG SG07: SVOC internal standard perylene-d12 was out of control low for sample JF-PLSD-PS-37-7-M. The sample was reanalyzed at a dilution and all internal standards were in control. Both sets of data are provided for review. Compounds associated with internal standard perylene-d12 are qualified as estimated (UJ/J) on the initial run for sample JF-PLSD-PS-37-7-M. It should also be noted that the matrix spike analysis was performed on this sample with poor and unacceptable recoveries for many compounds. Refer to the matrix spike portion of this report for more discussion.

Blank Contamination: The method blanks and equipment blanks were free of contamination with the following exceptions:

SDG SG07: The method blank analyzed on 2/2/11 contained bis(2-ethylhexyl) phthalate (DEHP). ALL associated samples with DEHP detections were "B" qualified by ARI to indicate that the analyte was detected in the method blank. Associated samples (Samples JF-PLSD-PS-15B, JF-PLSD-PS-15B REEXTRACT, JF-PLSD-PS-24A, JF-PLSD-PS-24B, JF-PLSD-PS-24B DILUTION, JF-PLSD-PS-37-7, JF-PLSD-PS-24B-D, JF-PLSD-PS-37-7-M DILUTION) with DEHP detections below 930 µg /kg (sample weight, volume or dilution factors were not considered) are qualified as not detected due to blank contamination (UB) to indicate laboratory contamination.

Surrogate Recovery: All surrogate recoveries were within ARI control limits with the following exceptions:

SDG SG07: Case narrative notes indicate that three of four acid fraction surrogates were low and below control limit criteria for Sample JF-PLSD-PS-15B. Sample JF-PLSD-PS-15B was re-extracted and re-analyzed at a 1X dilution with all surrogate recoveries within ARI control limit criteria. Original results for sample JF-PLSD-PS-15B are qualified as Do Not Report (DNR) due to surrogate issues. As noted above, Sample JF-

PLSD-PS-15B re-extraction occurred one day outside of the recommended 14 day holding time. No action was taken in this case as it is a minor holding time exceedance.

SDG SG07: Case narrative notes indicate that acid fraction surrogates were low (but greater than 10%) and below control limit criteria for sample JF-PLSD-PS-24B. Sample JF-PLSD-PS-24B was re-extracted and re-analyzed at a 3X dilution with all surrogate recoveries within ARI control limit criteria. Acid fraction results for initial run on Sample JF-PLSD-PS-24B are qualified as estimated (UJ/J). Both sets of results were provided by ARI for review. In this case the highest detected concentration from the initial run or dilution run for an analyte is reported. In cases where compounds are non-detect for both runs the lowest reporting limit is reported. Refer to Reporting Criteria discussion above for further guidance.

SDG SG07: Case narrative notes indicate that several surrogates were outside control limit criteria recovery were either high or low. No action was taken in these cases since no more than two or more surrogates were outside of control limit for each fraction and none were below 10%.

Matrix Spike Compound Recovery: MS/MSD spike recoveries and relative percent difference (RPD) were evaluated. It should be noted that ARI defaults to Laboratory Control Sample (LCS) criteria to internally evaluate matrix spike recoveries. Approved SAP/QAPP (Floyd|Snider, 2010) acceptance criteria for soil matrix spikes is 10 – 160% for recoveries and 50% for RPDs. MS/MSD recoveries and RPDs are acceptable per the SAP/QAPP with the following exceptions and discussions:

SDG SG07: Matrix spike analysis was performed on Sample JF-PLSD-PS-37-7-M. Percent recoveries of various compounds were low and some were reported as "NA" because of matrix interference. All SVOC results are qualified as estimated for JF-PLSD-PS-37-7-M due to poor spike compound recoveries. Note the sample was successfully reanalyzed at a dilution but the matrix spike was performed only at the initial dilution level.

Laboratory Control Sample Recovery: Laboratory control samples/laboratory control sample duplicates (LCS/LCSD) were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for SVOCs were downloaded from ARIs website. LCS/LCSD percent recoveries and RPD were acceptable and within specified ARI criteria.

Field Duplicate Sample Analysis: Field duplicate results for SVOCs are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 50% RPD for soil:

SDG SG07: Field duplicate sample pair (JF-PLSD-PS-24B, and JF-PLSD-PS-24B-D) PCB RPD results are less than 50 % RPD.

POLYCHLORINATED BIPHENYLS

The laboratory provided a complete Level 1 data package for the PCB analysis and the items reviewed during validation are summarized below.

Analytical Methods: Samples for PCB analysis were analyzed by gas chromatography/electron capture detector (GC/ECD) using USEPA Method 8082, in accordance with the method specified in the SAP/QAPP (Floyd|Snider 2010).

Sample Holding Times: All samples were prepared and/or analyzed within the recommended holding times as follows:

All soil samples were extracted within 14 days of sample collection and analyzed within 40 days of extraction. The rinsate sample (JF-PLSD-PS-15B-R) and PCB wash water sample (JF-PLSD-RJW-4L) were extracted within 7 days of sample collection and analyzed within 40 days of extraction. Holding time criteria were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussions:

The SAP/QAPP specifies a reporting limit range for PCBs and is not compound specific.

SDG SG07: PCB reporting limits for soil as stipulated in SAP/QAPP (Floyd|Snider, 2010) are 33 µg /kg or 4 µg /kg (low level). ARI equated the low level PCB analysis request to Puget Sound Dredged Disposal Analysis (PSDDA) reporting limit and reported all associated soil results under "PSDDA PCB by GC/ECD". ARI clarified that EPA Method 8082 was performed to analyze samples as requested in the SAP/QAPP (Floyd|Snider, 2010). The requested reporting levels were not met for samples associated with this SDG due to elevated concentrations of PCBs in the samples. ALL samples associated with these SDG were analyzed at medium level due to elevated sample PCB concentrations. No action was taken other than to note this.

SDG SG07: In certain cases the laboratory assigned a "Y" qualifier to Aroclor result(s) to indicate that "the analyte was not detected at or above the reported concentration". The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a "raised reporting limit".

SJ56: PCB reporting limits for water are 0.01 µg/L. This requested reporting levels were not met for this PCB wash sample (Sample JF-PLSD-RJW-4L) associated with this SDG. No action was taken other than to note that this is a rinsate and was used to verify the decontamination procedure.

Blank Contamination: The method blanks and rinsate blank (JF-PLSD-PS-15B-R) were free of target compounds with the following exceptions:

SDG SG07: Aroclor 1254 was detected at 0.19 µg/L (reporting level of 0.010 µg /L) in the rinsate blank (JF-PLSD-PS-15B-R). The rinsate blank was collected immediately after soil sample JF-PLSD-PS-15B. No action was taken since the Aroclor 1254 detection in Sample JF-PLSD-PS-15B was greater than ten times the detection in the rinsate blank.

SDG SJ56: Aroclors 1248 and 1254 was detected at low levels in the PCB wash sample (Sample JF-PLSD-RJW-4L). No action was taken other than to note that this is a rinsate and was used to verify the decontamination procedure.

Surrogate Recovery: Soil surrogate recoveries were evaluated against current ARI control limits for medium level PCBs which are 22 -168 % for decachlorobiphenyl (DCBP) and 28 - 106 % for tetrachlorometaxylene (TCMX). Water surrogate recoveries were evaluated against current ARI control limits of 10 - 128 % for DCBP and 25 - 100 % for TCMX. All criteria were met with the following exceptions:

SDG SG07: ALL sample surrogate results, with two exceptions (JF-PLSD-PS-15A and JF-PLSD-PS-24A), were reported by the laboratory as "D" to indicate "the spiked compound was not detected due to sample extract dilution". Sample extracts were diluted due to elevated PCB concentrations and as a result surrogates were diluted out. No action was taken in these cases.

SDG SG07: Sample JF-PLSD-PS-15A surrogate TCMX recovery is high at 124%. DCBP surrogate recovery was within criteria. No action was taken.

Matrix Spike Compound Recovery: Matrix Spike/Matrix Spike Duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were evaluated. It should be noted that ARI defaults to LCS criteria to internally evaluate matrix spike recoveries. Approved SAP/QAPP (Floyd|Snider, 2010) acceptance criteria for soil matrix spikes is 40–140 % for recoveries and 50% for RPDs.

SDG SG07: MS/MSD was performed on sample JF-PLSD-PS-37-7-M. Percent recoveries were reported as "NA" because of the elevated concentration of PCBs in the sample and subsequent dilution of the extract. No action was taken in this case.

SDGs SG07/SJ49 and SJ56: An MS/MSD is not required on various QC samples such as a rinsate and/or PCB Wash Sample (Samples JF-PLSD-PS-15B-R and JF-PLSD-RJW-4L).

Laboratory Control Sample Recovery: LCS/LCSD were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for PCBs were downloaded from ARIs website. LCS/LCSD percent recoveries and RPDs were acceptable and within specified ARI criteria.

Field Duplicate Sample Analysis: Field duplicate results for PCBs are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 50% RPD for soil as identified below:

SDG SG07: Field duplicate sample pair (JF-PLSD-PS-24B, and JF-PLSD-PS-24B-D) PCB RPD results are less than 50 % RPD.

DIESEL AND EXTENDED RANGE TOTAL PETROLEUM HYDROCARBONS - diesel, motor oil and mineral oil

The laboratory provided a complete Level 1 data package for total petroleum hydrocarbon (TPH) analysis. The items reviewed during validation are summarized below.

Analytical Methods: Samples for TPH parameters were analyzed according to the method specified in the SAP/QAPP using the following methodology:

- TPH- Diesel in the C12-C24 range,
- TPH- Motor Oil in the C24-C38 range.
- TPH- Mineral Oil in the C24-C38 range.

Sample Holding Times: All samples were extracted within 14 days (7 days for water) of sample collection and analyzed within 40 days from the date of extraction to analysis. Holding time criteria were met.

Laboratory Reporting: The laboratory compared sample chromatograms with diesel, motor oil, and mineral oil standard chromatograms and, in some cases, based on this comparison ARI qualified results as diesel range organics (DRO) and residual range organics (RRO) to indicate qualitative or quantitative uncertainty with the results (the chromatogram was a poor match or other organics were detected in the sample). NWTPH-Dx (diesel, motor oil, and mineral oil) sample results which are qualified "DRO" or "RRO" by the laboratory are considered estimated and qualified (J). Diesel results for samples JF-PLSD-PS-15A, JF-PLSD-PS-15B, JF-PLSD-PS-24A, JF-PLSD-24B, JF-PLSD-PS-37-7, JF-PLSD-PS-37-2, JF-PLSD-PS-24B-D, JF-PLSD-PS-37-7-M are qualified as estimated (J) due to laboratory qualification (DRO).

SDG SG07: Mineral oil range is described in the footnotes as CEMPTY - CEMPTY. ARI was contacted to modify the footnotes for mineral oil to read C24 to C38.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved Work Plan (Floyd|Snider, 2010). The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

Blank Contamination: The method blanks were free of target compounds.

Surrogate Recovery: All surrogate recoveries were within ARI control limits with the following exceptions:

SDG SG07: Sample JF-PLSD-PS-37-2 fuel concentrations are elevated and the sample extract was diluted, and as a result the surrogates were diluted out. No action was taken.

Matrix Spike Compound Recovery: Matrix Spike/Matrix Spike Duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were evaluated. It should be noted that ARI defaults to LCS criteria to internally evaluate matrix spike recoveries. Approved SAP/QAPP (Floyd|Snider, 2010) acceptance criteria for MS/MSDs is 40–140 % for recoveries and 50% for RPDs for soils.

SDG SG07: Matrix spike analysis was performed on sample JF-PLSD-PS-37-7-M. Percent recoveries were reported as "NA" because of the elevated concentration of diesel and extended range fuels in the sample. No action was taken in this case.

Laboratory Control Sample Recovery: LCS/LCSD were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for TPH were downloaded from ARIs website. LCS/LCSD percent recoveries and RPD were acceptable and within specified ARI criteria.

Field Duplicate Sample Analysis: Field duplicate results for TPH are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 50% RPD for soil are identified below:

SDG SG07: Field duplicate sample pair (JF-PLSD-PS-24B, and JF-PLSD-PS-24B-D) TPH RPD results are less than 50 % RPD.

INORGANICS

The laboratory provided a complete Level 1 data package for the inorganic analysis. The items reviewed during validation are summarized below.

Analytical Methods: Soil sample metals analysis were prepared using EPA Methods 3050B and for TCLP metals digestion USEPA Method 1311. Metals analysis was completed by USEPA Methods 6010B and for TCLP analysis USEPA Methods 6010B and 7470A, in accordance with the methods specified in the SAP/QAPP.

Sample Holding Times: All samples were prepared and analyzed within the recommended holding period from the date of collection; 180 days for metals and 28 days for mercury. All holding time criteria were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussion:

Requested method reporting levels were not specified for the water samples (mostly rinsates) undergoing metals (Arsenic, Cadmium, Copper, Lead, Nickel or Zinc) analysis nor for soils undergoing TCLP metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver) analysis. No action was necessary.

The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds or interferences. No action was taken.

Blank Contamination: The method blanks were free of target compounds with the following exception:

SG07: A low concentration of barium was detected in the TCLP metals method blank and case narrative notes indicate that this is likely due to the filtering process. This detection has no impact on the associated sample result since barium was detected in the sample greater than 5X the low level detection in the blank.

Laboratory Control Sample Recovery: LCS (blank spike) samples were performed with each analytical batch. All LCS were acceptable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 75 to 125 percent.

Matrix Spike Analysis: Matrix Spike (MS) analysis was performed on selected samples. Blank spike data was used to assess accuracy in cases where matrix spike quality control was not performed by ARI. The metals MS percent recoveries were acceptable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 75 to 125 percent with the following exceptions:

SDG SG07: Matrix spike analysis was performed on Sample JF-PLSD-PS-37-7-M with poor copper spike recovery (at 65.7%). The copper result for Sample JF-PLSD-PS-37-7-M is qualified as estimated (J).

Laboratory Duplicate Analysis: Laboratory duplicate analysis was performed on selected samples. Duplicate analysis was within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD for both soil and water (with few exceptions the RPD is calculated when results are greater than five times the reporting level).

Field Duplicate Sample Analysis: Field duplicate results for metals are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD for both soil and water (with few exceptions the RPD is calculated when results are greater than five times the reporting level) with the following exceptions:

SDG SG07: Field duplicate sample pair (JF-PLSD-PS-24B, and JF-PLSD-PS-24B-D) metal RPDs results are less than 20 % RPD except for copper, lead, and nickel. Copper, lead, and nickel results for samples JF-PLSD-PS-24B and JF-PLSD-PS-24B-D are qualified as estimated (J).

Data Qualifiers

The following qualifiers were used to modify the data quality and usefulness of individual analytical results.

U - The constituent was analyzed for, but was not detected above the reported sample quantitation limit.

B - The constituent was detected in the associated method blank.

J - The constituent was positively identified and detected; however, the concentration reported is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.

UJ – The constituent was not detected; the associated quantitation limit is an estimated value because quality control criteria were not met.

DNR - Do Not Report result(s). Use re-extracted and re-analyzed result(s).

R – Data are rejected due to significant exceedence of quality control criteria. The analyte may or may not be present. Additional sampling and analysis may be required to determine the presence or absence of the constituent. For statistical reasons, rejected values are not included in the database.

Y – The reporting limit is elevated due to interference. The result is not detected.

Data Assessment

Independent review was performed on chemistry data from the analytical laboratory to determine that data are of known and documented quality. Data have been evaluated and based on this information and in my professional judgment, the data are acceptable for use except where indicated by data qualifiers which may modify the usability of the data.

Jessie Compeau

Jessie Compeau
Validator
Informa, LLC

March 8, 2011
Date

Erin Breckel

Erin Breckel;
Acting Quality Assurance Manager
Floyd|Snider

3/28/11
Date

REFERENCES

EPA 1999, USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, EPA-540/R-99/008, October 1999.

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EPA 2008, USEPA Contract Laboratory Program, National Functional Guidelines for Superfund Organic Methods Data Review, EPA-540-R-08-01, June 2008.

Floyd|Snider, 2010. *Source Control Action 15-inch and 24-inch Pipes Cleanout Work Plan, Jorgenson Forge Outfall Site*. Seattle, Washington Prepared for The Boeing Company. December 17, 2010.

BOEING COMPANY – JORGENSEN FORGE OUTFALL SITE
SEATTLE, WASHINGTON
CMP Sampling - January of 2011
DATA VALIDATION QA/QC REVIEW

INTRODUCTION

A total of thirty-six soil samples, nine groundwater samples, two rinsate blank samples were collected January 13 and 14 of 2011. This sampling was conducted as part of the Corrugated Metal Pipe investigation according to the specifications in the *Source Control Action - 15-inch and 24-inch Pipes Cleanout Work Plan (Floyd|Snider, 2010)*. Samples were analyzed by Analytical Resources Incorporated (ARI) of Tukwila, Washington for the following parameters:

- Volatile Oraganic Compounds (VOCs) by USEPA 8260C
- Semivolatile Organic Compounds (SVOCs) by USEPA Method 8270D
- Polychlorinated biphenyls (PCBs) by USEPA 8082
- Diesel and Extended Range by Washington State Department of Ecology NWTPH-Dx
- Metals (Arsenic, Cadmium, Copper, Lead, Nickel, and Zinc) by USEPA Method 6010

Samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (USEPA SW-846)* and *Washington State Department of Ecology Methods for Petroleum Hydrocarbon Analysis*.

Samples were analyzed and results reported by the laboratory in batch numbers as summarized below:

SDG SE66 (VOCs, SVOCs, PCBs, Diesel and Extended Range, and Total Metals):

Groundwater Samples

JF-T2B2-GW-15	JF-T2B4-GW-20	JF-T3B1-SO-13-R
JF-T2B3-GW-15	JF-T3B4-GW-24	
JF-T2B3-GW-15-D	JF-T3B3-GW-15	

Soil Samples

JF-T2B1-SO-03	JF-T2B2-SO-08	JF-T2B3-SO-13
JF-T2B1-SO-08	JF-T2B2-SO-13	JF-T2B4-SO-03
JF-T2B1-SO-13	JF-T2B3-SO-02	
JF-T2B2-SO-03	JF-T2B3-SO-08	

SDG SE67 (SVOCs, PCBs, Diesel and Extended Range, and Total Metals):

Soil Samples

JF-T3B2-SO-08	JF-T3B1-SO-13	JF-T3B4-SO-23
JF-T3B2-SO-13	JF-T2B4-SO-18	JF-T3B3-SO-03
JF-T3B2-SO-13-D	JF-T2B4-SO-23	JF-T3B3-SO-08
JF-T3B1-SO-03	JF-T3B4-SO-03	JF-T3B3-SO-13
JF-T3B1-SO-08	JF-T3B4-SO-13	JF-T3B2-SO-03

SDG SE82 (VOCs, SVOCs, PCBs, Diesel and Extended Range, and Total Metals):

Groundwater Samples

JF-T1B2-SO-03	JF-T1B4-SO-12	JF-T1B2-SO-03-D
JF-T1B1-SO-03	JF-T1B4-SO-18	JF-T1B2-SO-08
JF-T1B1-SO-08	JF-T1B3-SO-03	JF-T1B2-SO-13
JF-T1B1-SO-13	JF-T1B3-SO-08	
JF-T1B4-SO-03	JF-T1B3-SO-18	

Soil Samples

JF-T1B2-GW-15	JF-T1B4-GW-20	JF-T3B2-GW-15
JF-T1B3-GW-20	JF-T1B1-SO-13-R	

Quality assurance/quality control (QA/QC) reviews of laboratory data were performed in the laboratory in accordance with the laboratory quality assurance program plan. The data validation QA/QC review focused primarily on laboratory result summary sheets and quality control summary sheets to ensure that work plan data quality objectives were met for the project. Data validation was conducted in accordance with the criteria outlined in the National Functional Guidelines for Organic Data Review (EPA 1999 and 2008) and the National Functional Guidelines for Inorganic Data Review (EPA 2004), modified to include method specific requirements of the laboratory analytical methods.

The validation level specified in Work Plan and Appendix B SAP/QAPP of the *Source Control Action - 15-inch and 24-inch Pipes Cleanout Work Plan (Floyd|Snider, 2010)* is a Level 3 for the Corrugated Metal Pipe (CMP) work which is considered an in-depth review. Due to an inadvertent oversight Level 3 data packages were not initially requested from ARI. After receipt of requested data from the laboratory, a Level 3 review was performed and results are provided in this report. Qualified results (referred to in the Work Plan as external data validation qualifiers) were added by the data validator to electronic data deliverables (EDD). The following data requirements were evaluated:

- Package completeness
- Sample identifications and reported analyses match the Chain-of-Custody Form
- Sample holding times and sample preservation
- Verification that the required detection limits and reporting limits have been achieved.
- Verification that the field duplicates, matrix spike/matrix spike duplicate samples MS/MSDs, and laboratory control samples were analyzed at the proper frequency.

- Laboratory control sample recoveries
- Surrogate recoveries (organics only)
- Laboratory method blanks
- Rinsate blank

Organic Review

- Instrument Tuning Summary (VOC and SVOC)
- Initial and Continuing Calibration Summary (VOC, SVOC, PCB, TPH, and Metals)
- Internal Standard Summary (VOC, SVOC, and PCB)

Metals Review

- Initial and Continuing Calibration Blanks Summary
- Interference Check Standard Recovery Summary (Metals)
- Instrument or Method Detection Limit Summary
- ICP Interelement Correction Factors Summary
- Linear Range Summary
- Preparation Log and Analysis Sequence Summaries

CASE NARRATIVE COMMENTS

Review of the cover letters associated with the Sample Delivery Groups (SDGs) indicates multiple analytical issues for SDG SE66, SE67, and SE82. These are addressed in appropriate sections of this report. The following summarizes data anomalies or discrepancies noted in the case narratives:

SDG SE66: Issues with VOC continuing calibrations (CCAL) and VOC laboratory control sample (LCS) recovery. Refer to VOC section for more details.

SDG SE66: Issues with SVOC CCAL and SVOC LCS recovery. Refer to SVOC section for more details.

SDGs SE66 and SE67: Level 3 Package Addendum March 22, 2011 case narrative notes indicate that there was an issue with the mineral oil CCAL data. Refer to the TPH section for more details.

SDG SE67: Issues with SVOC CCAL. Refer to SVOC section for more details.

SDG SE67: Issues with PCB surrogate and matrix spike recovery. Refer to PCB section for more details.

SDG SE67: Issues with the metals matrix spike recovery and duplicate relative percent differences (RPDs). Refer to the metals section for more details.

SDG SE82: Issues with VOC CCALs and VOC LCS recovery. Refer to VOC section for more details.

SDG SE82: Issues with SVOC surrogate recovery, SVOC CCALs, and SVOC LCS recoveries. Refer to SVOC section for more details.

SDG SE82: Issues with PCB surrogate recoveries. Refer to PCB section for more details.

SDG SE82: Issues with the metals duplicate RPDs for nickel. Refer to the metals section for more details.

SDGs SE66 and SE82: Case narrative notes indicate that SVOC 1/20/11 CCAL is out of control low for phenol, n-nitroso-di-n-propylamine, 2,2-oxybis (1-chloropropane) **and** 2,4-dinitrophenol **and** benzo (g,h,i) perylene and dibenzo (a,h) anthracene were out of control high. Due to typographical error (too many ands) ARI was contacted and confirmed that recovery of 2,4-dinitrophenol was recovered low and remaining compounds were recovered high.

SDG SE82: Nine soil samples were submitted to ARI but archived for possible analysis at a later date.

SAMPLE CUSTODY, SAMPLE RECEIPT, and PRESERVATION

Chain of custody (COC) record, laboratory analysis request, cooler receipt forms, and other documentation (i.e. preservation verification form) were reviewed. Samples were received by ARI Laboratory in good condition with the following discussion:

SDG SE66: Review of Cooler Receipt Form indicates that there was a discrepancy between sample identifications on a bottle and chain-of-custody. ARI resolved this discrepancy internally. The label reading JF-T3B3-GW-23 on the bottle should read Sample JF-T3B3-GW-15 (as recorded on the chain of custody). This was confirmed by ARI internally by comparing time of collection on the bottle to the COC.

SDG SE66: Review of Cooler Receipt Form shows that the COC reported eight containers were provided for Sample JF-T3B1-SO-13-R however ARI confirmed that nine containers were received. No action was taken.

SDGs SE66 and SE82: Review of the data package versus the COC indicates that Trip Blank sample was analyzed but not recorded on the COC. No action was taken other than to note that the Trip Blank should be recorded on the COC.

SDG SE82: Cooler temperature was received by the laboratory at 19.3°C above the National Functional Guideline recommended temperature of 2°C to 6°C. No action was taken since the samples were collected and delivered to ARI on the same day. Samples did not have sufficient time to cool.

SDG SE82: Sample identifications on bottles read Sample JF-T1B1-13-R and Sample JF-T1B2-GW and should read (as they read on the COC) Sample JF-T1B1-**SO**-13-R and Sample JF-

T1B2-GW-**15** respectively. ARI resolved the issue internally and corrected the sample bottle identifications.

REPORTING CRITERIA

In certain cases the laboratory performs dilutions, re-extractions, and/or re-analyses and reports multiple sample results on an analytical parameter. These data are considered useful however it should be noted that database results reflect ONLY one result for each sample. The data user should be aware that decision criteria used to report these results in these cases typically are as follows:

1) If the analyte exceeds the calibration range, then the diluted result is selected;
2) If an analyte is detected in both runs, then the higher concentration is selected from the two runs (more conservative);
3) If an analyte is detected in one run, but not the other, then the detection (more conservative) is selected;
4) If the analyte is not detected in either run, the lower reporting limit is selected.

It should be noted that there are some exceptions to the decision criteria listed above but in these cases the selected result will be clearly identified (and the reasons for doing so) for the data user.

VOLATILE ORGANIC COMPOUNDS

The laboratory provided a complete Level 3 data package for the VOC analyses. The items reviewed during validation are summarized below. Associated results are qualified accordingly.

Analytical Methods: Samples for VOC analysis were analyzed by purge & trap gas chromatography/mass spectrometry (GC/MS) using USEPA Method 8260C in accordance with the method specified in the SAP/QAPP (Floyd|Snider, 2010).

Sample Holding Times: All water samples were analyzed within 14 days of sample collection. Holding times were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussions:

The SAP/QAPP specifies a reporting limit range for water VOCs and is not compound specific. The reporting limit range in the SAP/QAPP was not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

SDG SE82: Sample JF-T1B2-GW-15 VOC compound trichloroethene was qualified as "E" by ARI to indicate that the concentration of the target analyte exceeded the instrument calibration range. Data validator qualified trichloroethene result in the initial run (1/17/11) for sample JF-T1B2-GW-15 as Do Not Report (DNR). Refer to diluted sample re-analysis (1/18/11) for

trichloroethene result. Refer to the Reporting Criteria section for further guidance on selection of other VOC results from the initial run versus the diluted run.

Instrument Performance Check (Tuning): Functional guidelines stipulate that tuning should be performed (via check solution) to ensure optimum instrument performance. Tuning should be performed and verified at the beginning of each 12-hour period during which samples are analyzed. Relative % abundance of bromofluorobenzene (BFB) ions should fall within ion abundance criteria. Summary forms were reviewed to verify that ion abundance criteria for BFB were met and that 12-hour criteria were met. All criteria were met.

Instrument Calibration: Functional guideline criteria for initial calibrations (ICALs) shall demonstrate linearity between instrument response and at least five calibration standards at a range of concentrations. The ICAL relative response factors (RRFs) for compounds are greater than or equal to 0.05, percent relative standard deviations (% RSDs) are less than 30% (or for linear or non-linear calibration curves the best curve fit must be at least 0.99). Continuing calibration (CCAL) shall be performed to verify instrument linearity and performance and shall be analyzed at the beginning of each 12-hour analysis period. CCAL RRF should be greater than or equal to 0.05 and percent difference (%D) between the ICAL RRF and CCAL RRF shall not exceed $\pm$ 25% D. ARI applies a more stringent criteria of $\pm$ 20% D (as required by the method) for evaluating CCALs. These compounds are noted in the case narratives and associated positive detections are qualified (Q) by the laboratory. Calibration criteria were met with exceptions noted below:

SDGs SE66 and SE82: VOC ICAL (Instrument ID is NT5) was performed on 12/3/2010. Review indicates that RRF data for acrolein was less than 0.05. All associated groundwater sample results for acrolein are qualified as rejected (R) due to poor ICAL RRF.

SDGs SE66 and SE82: VOC CCAL data from 1/17/11 show low recovery (below acceptance criteria) for compound 2-Chloroethylvinylether (2CEVE). Level 3 review indicates that percent difference (% D) for 2CEVE was less than $\pm$ 25% D. No action was taken for 2CEVE results in associated samples.

SDG SE82: VOC CCAL data from 1/18/11 show low (below acceptance criteria) recovery for compound 2CEVE AND high (above acceptance criteria) recovery for acrolein and methyl iodide. Level 3 review indicates that percent difference (% D) for 2CEVE and methyl iodide were less than $\pm$ 25% D. No action was taken for 2CEVE and methyl iodide results in associated samples. Refer to the ICAL discussion above regarding poor RRF results for acrolein.

Internal Standards: Functional guidelines stipulate that internal standard area counts may not be more than a factor of 2 (-50 percent to +100 percent) from either the ICAL midpoint standard or the associated CCAL. The internal standard retention times in each sample must not vary by more than $\pm$ 30 seconds from the ICAL midpoint standard or the associated CCAL. ARI used the ICAL midpoint standard to establish upper and lower limits for area counts and retention time windows. All internal standard area counts and retention times are acceptable.

Blank Contamination: The method blanks and rinsate blanks were free of contamination with the following exceptions

SDG SE82: Rinsate blank sample (JF-T1B1-SO-13-R) contained low level hits of methylene chloride and chloroform. The rinsate blank was collected immediately after soil sample JF-T1B1-SO-13 (refer to SDG SE82M). No action was taken as the soil samples were not analyzed for VOCs.

Surrogate Recovery: All surrogate recoveries were within ARI control limits.

Matrix Spike Compound Recovery: For SDGs SE66 and SE82 matrix spike analysis was not performed by the laboratory. Refer to LCS/LCSD and field duplicate results for accuracy and precision data.

Laboratory Control Sample Recovery: Laboratory control samples/laboratory control sample duplicates (LCS/LCSD) were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for VOCs were downloaded from ARIs website. LCS/LCSD percent recoveries and RPD were acceptable and within specified ARI criteria with the following exceptions:

SDGs SE66 and SE82: LCS/LCSD (1/17/11) recoveries were below ARI control limits for 2CEVE and above ARI control limits for methyl iodide. The 2CEVE result for the LCS is 76% slightly below ARI's lower limit criteria of 80% but above ARI's marginal exceedance criteria of 75%. The 2CEVE result for the LCSD is 72%, slightly below ARI's marginal exceedance criteria of 75%. Since the LCS result is within marginal exceedance criteria, no further action is taken. Methyl iodide results are slightly above ARI control limit of 120% but within marginal exceedance upper limit criteria of 127%. No action is taken in this case.

SDG SE82: LCS (1/18/11) recovery was above ARI control limits for methyl iodide. Methyl iodide is not detected in associated samples. No further action was taken.

Field Duplicate Sample Analysis: Field duplicate results for VOCs are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD for water:

SDG SE66: Field duplicate sample pair (JF-T2B3-GW-15 and JF-T2B3-GW-15-D) VOC RPD results are less than 20 % RPD.

SEMIVOLATILE ORGANIC COMPOUNDS

The laboratory provided a complete Level 3 data package for the SVOC analyses. The items reviewed during validation are summarized below. Associated results are qualified accordingly.

Analytical Methods: Samples for SVOC analysis were analyzed by gas chromatography/mass spectrometry (GC/MS) using USEPA Method 8270D, in accordance with the method specified in the SAP/QAPP.

Sample Holding Times: All soil samples were extracted within 14 days of sample collection and analyzed within 40 days from the date of extraction to analysis. The rinsate samples (JF-T1B1-SO-13-R and JF-T3B1-SO-13-R) were extracted within 7 days of sample collection and analyzed within 40 days of extraction. Holding time criteria are met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussions:

The SAP/QAPP specifies a reporting limit range for soil SVOCs and is not compound specific. The SAP/QAPP did not specify reporting limits for water SVOCs. The only water samples collected were rinsate samples.

The soil reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

SDG SE67: For sample JF-T2B4-SO-18, SVOC compound bis(2-ethylhexyl) phthalate (DEHP) was qualified as "ES" by ARI to indicate that the concentration of the target analyte exceeded the instrument calibration range and saturated the detector. Data validator qualified DEHP result in the initial run (1/21/11) for sample JF-T2B4-SO-18 as Do Not Report (DNR). Refer to diluted sample re-analysis (1/24/11) for the DEHP result. Remaining SVOC results should be reported from the initial analysis with one exception. Compound di-n-butylphthalate was not detected initially however it was detected in the diluted re-analysis and is reported. Refer to Reporting Criteria discussion above for further guidance.

Instrument Performance Check - Tuning: Functional guidelines stipulate that tuning should be performed (via check solution) to ensure optimum instrument performance. Tuning should be performed and verified at the beginning of each 12-hour period during which samples are analyzed. Relative % abundance of decafluorotriphenylphophine (DFTPP) ions should fall within ion abundance criteria. Summary forms were reviewed to verify that ion abundance criteria for DFTPP were met and that 12-criteria were met. All criteria were met.

Instrument Calibration:
Functional guideline criteria for initial calibrations (ICALs) shall demonstrate instrument linearity with at least five calibration standards at a range of concentrations. The ICAL relative response factors (RRFs) for compounds are greater than or equal to 0.05, percent relative standard deviations (% RSDs) are less than 30% (or for linear or non-linear calibration curves the best curve fit must be at least 0.99). Continuing calibration (CCAL) shall be performed to verify instrument linearity and performance and shall be analyzed at the beginning of each 12-hour analysis period. CCAL RRF should be greater than or equal to 0.05 and percent difference (% D) between the ICAL RRF and CCAL RRF shall not exceed $\pm$ 25% D. ARI applies a more stringent criteria of $\pm$ 20% D (as required by the method) for evaluating CCALs. These compounds are noted in the case narratives and associated positive detections are qualified (Q) by the laboratory. Calibration criteria were met with exceptions noted below:

SDG SE66: SVOC ICAL (Instrument ID is NT4) was performed 1/6/2011. Review indicates that RRF data for 2,4-Dinitrophenol was less than 0.05. Associated soil results were non-detect for 2,4-Dinitrophenol and are qualified as rejected (R) due to poor ICAL RRF.

SDG SE66 and SE82: Case narrative notes indicate that SVOC CCAL for water data on 1/20/11 show low recovery (below ARI acceptance criteria) for compounds phenol, n-nitroso-di-n-propylamine, 2,2-oxybis(1-chloropropane) and 2,4-dinitrophenol AND high recovery (above ARI acceptance criteria) for benzo(g,h,i)perylene and dibenzo(a,h)anthracene. Level 3 review indicates that percent difference (% D) for phenol, n-nitroso-di-n-propylamine, 2,2-oxybis(1-chloropropane), benzo(g,h,i)perylene, and dibenzo(a,h)anthracene) were less than $\pm$ 25% D. Therefore, no action was taken for these analytes. Results for the compound 2,4-dinitrophenol is qualified as estimated (UJ) in the associated rinsate samples (Samples JF-T3B1-SO-13-R and JF-T1B1-SO-13-R).

SDG SE66: Case narrative notes indicate that SVOC CCAL for soil data on 1/20/11 show low recovery (below ARI acceptance criteria) for compound 2,4-dinitrophenol AND high recovery (above ARI acceptance criteria) for 4-nitrophenol and flouranthene. Review of Level 3 data package indicates that benzo(b)fluoranthene also shows high recovery. As a result associated samples with positive detections for these analytes are "Q" qualified by ARI laboratory to indicate that the "detected analyte does not meet established acceptance criteria". Level 3 review indicates that % D for 2,4-Dinitrophenol and fluoranthene recovery are less than $\pm$ 25% D; however, refer to the ICAL discussion above since 2,4-dinitrophenol is already qualified due to poor ICAL result. No action was taken regarding fluoranthene. Associated samples (JF-T2B1-SO-03, JF-T2B1-SO-08, JF-T2B1-SO-13, JFT2B2-SO-03 and JFT2B2-SO-13) results for 4-nitrophenol and benzo(b)fluoranthene (reported as Total Benzofluoranthene) are qualified as estimated (UJ/J).

SDG SE66: SVOC CCAL for soil data on 1/21/11 show high recovery (above acceptance criteria) for compound 4-nitrophenol. Associated sample (JF-T2B2-SO-08, JF-T2B3-SO-02, JF-T2B3-SO-08, JF-T2B2-SO-13 and JF-T2B4-SO-03) results for 4-nitrophenol are qualified as estimated (UJ).

SDG SE66: SVOC CCAL for soil data on 1/21/11 for fluoranthene is "Q" qualified by ARI laboratory to indicate that the "detected analyte does not meet established acceptance criteria". No action was taken since Level 3 review indicates that % D was less than $\pm$25%.

SDG SE66: Sample JF-T2B4-SO-03 chrysene result is "M" qualified by ARI to indicate poor spectral match. The chrysene result for Sample JF-T2B4-SO-03 is considered estimated (J).

SDG SE67: SVOC CCAL for soil data on1/21/11 show low recovery (below acceptance criteria) for compounds 2,4-dinitrophenol (using $\pm$25% D). ALL associated sample results for 2,4-dinitrophenol are qualified as estimated (UJ).

SDG SE67: SVOC continuing calibration (CCAL) for soil data on 1/24/11 show low recovery (below ARI acceptance criteria) for compounds benzidine and 2,4-dinitrophenol and high recovery (above ARI acceptance criteria) for indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene,

and benzo(g,h,i) perylene. Level 3 review indicates that % D for indeno(1,2,3-cd)pyrene recovery is less than ± 25% D, therefore no action was taken. ALL associated sample results (Samples JF-T2B4-SO-18 Dilution and JF-T2B4-SO-23) for 2,4-dinitrophenol, dibenzo(a,h)anthracene, and benzo(g,h,i) perylene are qualified as estimated (UJ). No action was taken for benzidine as it is not listed on the client target analyte list.

SDG SE82: SVOC CCAL for soil data on 1/24/11 show low recovery (below ARI acceptance criteria) for compounds benzidine and 2,4-dinitrophenol and high recovery (above ARI acceptance criteria) for indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i) perylene . Level 3 review indicates that % D for indeno(1,2,3-cd)pyrene recovery is less than ± 25% D, therefore no action was taken. ALL associated sample results for 2,4-dinitrophenol are qualified as estimated (UJ). ALL associated sample results for dibenzo(a,h)anthracene and benzo(g,h,i) perylene are also qualified as estimated (UJ). No action was taken for benzidine as it is not listed on the client target analyte list.

SDG SE82: SVOC continuing calibration (CCAL) for soil data on 1/25/11 show low recovery (below acceptance criteria) for compounds 4,6-Dinitro-2-methylphenol and 2,4-Dinitrophenol AND high recovery (above acceptance criteria) for indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene and dibenzo(a,h)anthracene. Associated sample results (Samples JF-T1B2-SO-08 and JF-T1B2-SO-13) for the compounds 4,6-Dinitro-2-methylphenol, 2,4-Dinitrophenol, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, and dibenzo(a,h)anthracene are qualified as estimated (UJ).

SDG SE82: SVOC CCAL for soil data on 1/26/11 show high recovery (above acceptance criteria) for 2,4-dinitrophenol and benzo(g,h,i)perylene. ARI notes other compounds but these are under ± 25% D. The results for compound 2,4-dintirophenol and benzo(g,h,i)perylene are qualified as estimated (UJ) in the associated sample (Sample -T1B3-SO-08).

Internal Standards: Functional guidelines stipulate that internal standard area counts may not be more than a factor of 2 (-50 percent to +100 percent) from either the ICAL midpoint standard or the associated CCAL. The internal standard retention times in each sample must not vary by more than ± 30 seconds from the ICAL midpoint standard or the associated CCAL. ARI used the ICAL midpoint standard to establish upper and lower limits for area counts and CCAL midpoint to determine retention time windows. All internal standard area counts and retention times are acceptable.

Blank Contamination: The method blanks and equipment blanks were free of contamination with the following exceptions:

SDG SE66: Rinsate blank sample (JF-T3B1-SO-13-R) contained low level hits of phenol, diethylphthalate, di-n-butylphthalate. The rinsate blank was collected immediately after soil sample JF- T3B1-SO-13 (refer to SDG SE67F). No action was taken as compounds detected in the rinsate were not detected in the associated sample.

Surrogate Recovery: All surrogate recoveries were within ARI control limits with the following exceptions:

SDG SE82: Case narrative notes indicate that surrogate 2,4,6-Tribromophenol (TBP) recovery in soil sample JF-T1B3-SO-08 was below control limit criteria. No action was taken in this case since two or more surrogates were not outside of control limits for each fraction and none were below 10%.

Matrix Spike Compound Recovery: Matrix Spike/Matrix Spike Duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were evaluated. It should be noted that ARI defaults to LCS criteria to internally evaluate matrix spike recoveries. Approved SAP/QAPP (Floyd|Snider, 2010) acceptance criteria for soil matrix spikes is 10 –160% for recoveries and 50% for RPDs. The MS/MSD was performed on a client selected sample, Sample JF-T3B3-SO-03 from SDG SE67 and is representative for the two day CMP sampling event. MS/MSD recoveries and RPDs are acceptable per SAP/QAPP.

Laboratory Control Sample Recovery: LCS/LCSD were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for SVOCs were downloaded from ARIs website. LCS/LCSD % recoveries and RPD were acceptable and within specified ARI criteria with the following exception:

SDGs SE66 and SE82: LCS recoveries for chrysene and indeno(1,2,3-cd)pyrene and dibenzo(a,h)anthracene are high. The LCSD results for these compounds are within ARI control limit criteria. No action was taken.

Field Duplicate Sample Analysis: Field duplicate results for SVOCs are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 50% RPD for soil:

SDG SE67: Field duplicate sample pair (JF-T3B2-S0-13 and JF-T3B2-S0-13-D) SVOC RPD results are less than 50% RPD.

SDG SE82: Field duplicate sample pair (JF-T1B2-S0-03 and JF-T1B2-S0-03-D) SVOC RPD results are less than 50% RPD.

POLYCHLORINATED BIPHENYLS

The laboratory provided a complete Level 3 data package for the PCB analysis and the items reviewed during validation are summarized below.

Analytical Methods: Samples for PCB analysis were analyzed by gas chromatography/electron capture detector (GC/ECD) using USEPA Method 8082 in accordance to the method in the SAP/QAPP.

Sample Holding Times: All samples were prepared and/or analyzed within the recommended holding times as follows:

All soil samples were extracted within 14 days of sample collection and analyzed within 40 days of extraction. The groundwater and rinsate samples (JF-T1B1-SO-13-R and JF-T3B1-SO-13-R)

were extracted within 7 days of sample collection and analyzed within 40 days of extraction. Holding time criteria were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussions:

PCB reporting limits for soil stipulated in SAP/QAPP (Floyd|Snider, 2010) are 33 µg /kg (routine analysis) or 4 µg /kg (low level). ARI equated the low level PCB analysis request to Puget Sound Dredged Disposal Analysis (PSDDA) reporting limit and reported all associated soil results under "PSDDA PCB by GC/ECD". ARI clarified that EPA Method 8082 was performed to analyze samples as requested in the SAP/QAPP (Floyd|Snider, 2010). Several samples associated with these SDGs were analyzed at medium level with a reporting limit of 800 µg/kg due to elevated sample PCB concentrations. No action was taken other than to note this.

SDGs SE66 and SE82: PCB reporting limits for water stipulated in SAP/QAPP (Floyd|Snider, 2010) are 0.01 µg /L (low level). Floyd|Snider (1/14/2011) requested that the water samples undergo filtration using a 0.45 micron filter to ensure that sampling was in accordance with the EPA approved work plan. The 0.45 micron filtration step was to be performed in the field per the procedure outlined in the SAP/QAPP but this was modified by Floyd|Snider so that filtration could be performed by ARI upon sample receipt. Both EPA and client(s) were notified of the modification to the approved SAP/QAPP (Floyd|Snider, 2010). ARI includes a case narrative describing filtration steps (a 1 micron filter was utilized by ARI) in SDGs SE66 and SE82. Requested reporting levels were achieved except in cases were samples were analyzed at dilutions due to high concentrations of target compounds.

The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

Multiple SDGs: In certain cases the laboratory assigned a "Y" qualifier to Aroclor result(s) to indicate that "the analyte was not detected at or above the reported concentration". The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a "raised reporting limit".

Instrument Calibration: Functional guidelines stipulate that ICALs shall consist of a 5-point calibration using Aroclors 1016 and 1260 and single mid-range standard for remaining Aroclors. Functional guidelines also stipulate that ICAL % RSDs should be less than 20%. The CCAL shall consist of a mid-range standard and shall be analyzed at the beginning and end of each 12-hour analysis period. CCAL % D shall be within ±15% D. All calibration criteria were met with the following exceptions:

SDG SE66: For the CCAL performed on 1/22/2011, the Aroclor 1248 average % D was elevated on one column and outside of acceptance criteria of ±15% D. Associated samples were reanalyzed with acceptable CCAL data. Initial results were not reported. No action was necessary.

SDG SE67: For the closing CCAL performed on 1/21/11, the Aroclor 1260 average % D was recovered high and above acceptance criteria of ±15%D. ALL Arolors in associated samples (JF-T3B4-SO-13, JF-T3B4-SO-23, JF-T3B3-SO-03, JF-T3B3-SO-13, and JF-T3B2-SO-03) are qualified as estimated (UJ/J).

SDG SE67: For the closing CCAL performed on 1/25/2011, the Aroclor 1260 average % D was recovered high and above acceptance criteria of +15%D. All Aroclors in associated samples (JF-T3B4-SO-13 DILUTION, and JF-T3B4-SO-23) are qualified as estimated (UJ/J). There are two sets of results for these samples. Due to poor internal standard recovery on the initial run (refer to the Internal Standard section for further information) the reanalyzed results (re-analysis performed on 1/25/2011) should be reported with two exceptions:

> For Sample JF-T3B4-SO-13, Aroclor 1260 was initially detected at 11 µg/Kg and upon dilution and re-analysis was detected 10 µg/Kg. In this case Aroclor 1260 should be reported from the initial set of results and the reanalyzed Aroclor 1260 result for Sample JF-T3B4-SO-13 is reported as DNR.
>
> For Sample JF-T3B4-SO-23, Aroclor 1254 was initially detected at 4.5 µg/Kg but was not detected in the diluted and reanalyzed extract due to elevated reporting level. In this case Aroclor 1254 was reported from the initial set of results and the reanalyzed Aroclor 1254 result for Sample JF-T3B4-SO-23 was reported as DNR.

Internal Standards: Functional guidelines and method guidances specify that internal standard area counts in each sample must not vary by more than a factor of 2 from either the ICAL midpoint standard or the associated CCAL. Functional guidelines specify a retention time (RT) window of +0.07 minutes. USEPA Method 8000C (Determinative Chromatographic Separations) provides detailed methods for calculating RT windows which are applicable to USEPA Method 8082. ARI's RT window is acceptable at + 0.10 minutes. No action was taken. All internal standard area counts and retention times are acceptable with the following exceptions:

SDG SE67: Internal standard recovery (hexabromobiphenyl) for samples JF-T3B4-SO-13 and JF-T3B4-SO-23 (analyzed on 1/22/11) were below lower control limits for area on both columns. Both samples were re-analyzed at a dilution on 1/25/2011. It should be noted that internal standard recoveries for hexabromobiphenyl in both samples were still low on both columns but just above lower limit criteria. Refer to instrument calibration results for additional information. The initial PCB results for Samples JF-T3B4-SO-13 and JF-T3B4-SO-23 are considered estimated (UJ/J) and also qualified as DNR since there are two sets of results with the following exception. Aroclor 1254 was detected at 4.5 µg/Kg in the initial analysis of Sample JF-T3B4-SO-23 but was not detected in the reanalyzed and diluted sample extract. In this case the initial Aroclor 1254 result was reported and the reanalyzed result was reported as DNR.

Blank Contamination: The method and rinsate blanks (JF-T1B1-SO-13-R and JF-T3B1-SO-13-R) were free of target compounds with the following exception:

SDG SE66: Aroclor 1254 was detected at 0.057 µg/L (reporting level of 0.010 µg /L) in rinsate blank (JF-T3B1-SO-13-R). The rinsate blank was collected immediately after soil sample JF-T3B1-SO-13 (refer to SDG SE67). No action was taken since the Aroclor 1254 detection in Sample JF- T3B1-SO-13 was greater than ten times the detection in the rinsate blank.

Surrogate Recovery: Soil and water surrogate recoveries were evaluated against current ARI control limits. All criteria were met with the following exceptions:

SDG SE66: Sample JF-T2B4-SO-03 surrogate results were reported by the laboratory as "D" to indicate "the spiked compound was not detected due to sample extract dilution". Sample extracts were diluted due to elevated PCB concentrations and as a result surrogates were diluted out. No action was taken in this case.

SDG SE67: LCS surrogate decachlorobiphenyl (DCBP) is high and outside ARI's control limit criteria. No action was taken since LCSD surrogates were within the control limits.

SDG SE67: Sample JF-T3B3-SO-08 surrogates are outside control limit criteria. Sample results are considered estimated (UJ/J) due to poor surrogate recovery.

SDG SE67: Sample JF-T3B3-SO-03 DCBP surrogate (DCBP) was not reported. Matrix spike analysis was also performed on this sample with similar poor surrogate recovery for DCBP. Sample results are considered estimated (UJ/J) due to poor surrogate recovery. Refer to matrix spike discussion for additional details.

SDG SE82: Sample JF-T1B4-SO-03 tetrachlorometaxylene (TCMX) surrogate recovery was elevated and DCBP was not reported. Sample results are considered estimated (UJ/J) due to poor surrogate recovery.

SDG SE82: LCSD soil surrogate DCBP recovery was high at 110% slightly above ARI's control limit criteria for quality control samples (40-109%). No action was taken for since LCS soil surrogate recoveries are within the criteria.

Matrix Spike Compound Recovery: Matrix Spike/Matrix Spike Duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were evaluated. It should be noted that ARI defaults to LCS criteria to internally evaluate matrix spike recoveries. Approved SAP/QAPP (Floyd|Snider, 2010) acceptance criteria for soil matrix spikes is 40–140% and 50% RPD. Matrix spike recoveries are acceptable per SAP/QAPP with the following exceptions and discussions:

SDGSE67: MS/MSD analysis was performed on sample JF-T3B3-SO-03 with poor Aroclor 1260 recoveries. PCB results for sample JF-T3B3-SO-03 are qualified as estimated (UJ/J) due to poor spike recovery. Refer to surrogate section for more information regarding Sample JF-T3B3-SO-03 and the MS/MSD analysis on this sample.

SDGs SE66 and SE82: MS/MSD analysis was not performed. No action is taken. Refer to associated spike data from SDG SE67, LCS/LCSD data, surrogate recoveries, and field duplicate results for accuracy and precision data.

Laboratory Control Sample Recovery: LCS/LCSD were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for SVOCs were downloaded from ARIs website. LCS/LCSD percent recoveries and RPDs were acceptable and within specified ARI criteria.

Field Duplicate Sample Analysis: Field duplicate results for PCBs are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 50% RPD for soil and 20% RPD for water as identified below:

SDG SE66: Field duplicate sample pair (JF-T2B3-GW-15 and JF-T2B3-GW-15-D) PCB RPD results are less than 20% RPD.

SDG SE67: Field duplicate sample pair (JF-T3B2-S0-13 and JF-T3B2-S0-13-D) PCB RPD results are less than 50% RPD.

SDG SE82: Field duplicate sample pair (JF-T1B2-S0-03 and JF-T1B2-S0-03-D) PCB RPD results are less than 50% RPD.

DIESEL AND EXTENDED RANGE TOTAL PETROLEUM HYDROCARBONS - diesel, motor oil and mineral oil

The laboratory provided a complete Level 3 data package for total petroleum hydrocarbon (TPH) analysis. The items reviewed during validation are summarized below.

Analytical Methods: Samples for TPH parameters were analyzed using the following methodologies in accordance to the methods specified in the SAP/QAPP:

- TPH- Diesel in the C12-C24 range,
- TPH- Motor Oil in the C24-C38 range.
- TPH- Mineral Oil in the C24-C38 range.

Sample Holding Times: All soil samples were extracted within 14 days (7 days for water) of sample collection and analyzed within 40 days from the date of extraction to analysis. Holding time criteria were met.

Laboratory Reporting: The laboratory compared sample chromatograms with diesel, motor oil, and mineral oil standard chromatograms and, in some cases, based on this comparison ARI qualified results for diesel range organics (DRO) or residual range organics (RRO) to indicate qualitative or quantitative uncertainty with the results (the chromatogram was a poor match or other organics were detected in the sample). NWTPH-Dx (diesel, motor oil, and mineral oil)

sample results which are qualified "DRO" or "RRO" by the laboratory are considered estimated and qualified (J). Diesel results for the following SDGs are qualified as estimated (J) due to laboratory qualification (DRO).

- SDG SE66 - Samples JF-T2B1-SO-13, JF-T2B3-SO-02, JF-T2B3-SO-08, and JF-T2B4-SO-03,
- SDG SE67- Samples JFT3B4-SO-13; JF-T3B3-SO-03, JF-T3B3-SO-13 and,
- SDG SE82 - Samples JF-T3B2-SO-03; SDG SE82 JF-T1B1-SO-03, JF-T1B4-SO-12

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved Work Plan (Floyd|Snider, 2010). The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds. No action was taken.

The SAP/QAPP did not specify reporting limits for water TPHs. No action was taken since these were rinsate samples.

Initial and Continuing Calibration: *Analytical Methods For Petroleum Hydrocarbons* (Ecology, 1997) stipulate that the initial calibration curve must consist of a five point curve demonstrating linearity of the instrument and that the low standard should demonstrate analytical ability to achieve the reporting limit level. The initial calibration must have a linear correlation coefficient of at least 0.990 (data validator defaulted to RSD of 20% to evaluate) and no standard may exceed ±15% difference from the true value. Continuing calibration shall consist of a mid-range check standards analyzed before and after sample(s) and associated QC analysis. Frequency of CCAL analysis is not specified. The CCAL shall not exceed ±15% D from the true value of the standard. It should be noted that WA State stipulates that diesel #2 is the default fuel type for reporting purposes.

SDG SDG66: It was noted during the Level 3 data review that the case narrative was revised to indicate that CCALs for mineral oil were elevated and above acceptance criteria of ±15%D. Review of the run sequence log indicates that all SE66 samples are associated with mineral oil CCALs #2 and #3. ALL mineral oil results (all soil sample results and the rinsate result) are qualified as estimated (UJ/J) due to poor CCAL results for mineral oil. Motor oil is also quantitated in the same range (C24 to C38), but no action was taken since motor oil CCALs were acceptable.

SDG SDG67: It was noted during the Level 3 data review that the case narrative was revised to indicate that CCALs for mineral oil were elevated and above acceptance criteria of ±15%D. Review of the run sequence log indicates that one sample Sample JF-T2B4-SO-18 is associated with mineral oil CCALs #2 and #3. Mineral oil result in sample JF-T2B4-SO-18 is qualified as estimated due to poor CCAL results for mineral oil. Motor oil is also quantitated in the same range (C24 to C38) but no action was taken since motor oil CCALs were acceptable.

Blank Contamination: The method blanks were free of target compounds.

Surrogate Recovery: All surrogate recoveries were within ARI control limits with the following exceptions:

SDG SE67: Sample JF-T2B4-SO-18 fuel concentrations are elevated and the sample extract was diluted, and as a result the surrogates were diluted out. No action was taken.

Matrix Spike Compound Recovery: MS spike recovery was evaluated. It should be noted that ARI defaults to LCS criteria to internally evaluate matrix spike recoveries. Approved SAP/QAPP (Floyd|Snider, 2010) acceptance criteria for soil matrix spike recoveries are 40 to 140%. Matrix spike analysis was performed on a client selected sample, Sample JF-T3B3-SO-03, from SDG SE67 and is representative sample of the two day CMP sampling event. MS recoveries are acceptable per the SAP/QAPP. Refer to LCS/LSCSD and field duplicate results for precision data.

Laboratory Control Sample Recovery: LCS/LCSD were evaluated using ARI's control limit criteria. Approved SAP/QAPP (Floyd|Snider, 2010) LCS acceptance criteria indicate that ARI control limits are updated periodically. Current LCS control limit for SVOCs were downloaded from ARIs website. LCS/LCSD % recoveries and RPD were acceptable and within specified ARI criteria.

Field Duplicate Sample Analysis: Field duplicate results for TPH are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 50% RPD for soil and are identified below:

SDG SE67: Field duplicate sample pair (JF-T3B2-S0-13 and JF-T3B2-S0-13-D) PCB RPD results are less than 50% RPD.

SDG SE82: Field duplicate sample pair (JF-T1B2-S0-03 and JF-T1B2-S0-03-D) PCB RPD results are less than 50% RPD.

METALS

The laboratory provided a complete Level 3 data package for the inorganic analysis. The items reviewed during validation are summarized below.

Analytical Methods: Soil and water sample metals analysis were prepared using EPA Methods 3050B and 3010A, respectively. Metals analysis was completed by USEPA Method 6010B in accordance with the method specified in the SAP/QAPP.

Sample Holding Times: All samples were prepared and analyzed within the recommended holding period from the date of collection; 180 days for metals. All holding time criteria were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussion:

Requested method reporting levels were not specified for the water samples (rinsates) undergoing metals (Arsenic, Cadmium, Copper, Lead, Nickel or Zinc) analysis. No action was necessary.

The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds or interferences. No action was taken.

Initial and Continuing Calibration Verification: Functional guidelines stipulate that initial calibration verification (ICV) should be performed daily and prior to analytical run with a maximum difference of ±10% of the true value. Functional guidelines stipulate that continuing calibration verification (CCV) will be analyzed at a frequency of 10% or every two hours and recovery will also be within ±10% of the true value. These criteria were met.

Initial and Continuing Calibration Blank Summary Form: Functional guidelines stipulate that the initial calibration blank (ICB) will be analyzed after the ICV as required. The continuing calibration blanks (CCBs) were run at the frequency of 10% or every two hours after the CCV. ICB and CCVs analysis frequency criteria were met and both ICB and CCVs were free of target compounds.

Interference Check Standard Recovery: Functional guidelines stipulate that ICS consist of two solutions (ICSA and ICSAB). The purpose of the ICS is to evaluate potential interferences and the instruments ability to analyze samples with these interferents. Solution ICSA contains interferents and solution ICSAB contains analytes mixed with interferents. ICS must be run at the beginning of each run, after the ICV and at the end of each run (or every 20 samples). The functional guidelines criteria of ICS are +/- 20% recovery of the spiked analytes and the absolute values of the non-spiked analytes must be less than the reporting level. These criteria were met.

Serial Dilution Summary Form: Functional guidelines stipulate that an "ICP Serial Dilution analysis shall be performed on a sample from each group of samples with a similar matrix type or for each SDG, whichever is more frequent." ARI did not report serial dilution results with SDGs associated with this project as it was not requested prior to sample analysis. Adequate data are provided to assess interferences due to sample matrix. No action was taken.

Instrument or Method Detection Limit Summary Form: ICP instrument (Optima ICP 2) detection limit and linear ranges were established April 1, 2010 and February 3 of 2011. Sample results were within linear range.

ICP Interelement Correction Factors Summary Form: Correction factor data were provided by ARI. No action was taken other than to note that inter-element and background corrections were applied.

Blank Contamination: The method and rinsate blanks were free of target compounds.

Laboratory Control Sample Recovery: LCS (blank spike) samples were performed with each analytical batch. All LCS recoveries were acceptable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 75 to 125 percent.

Matrix Spike Analysis: Matrix Spike (MS) analysis was performed on selected samples. Blank spike data was used to assess accuracy in cases where matrix spike quality control was not performed by ARI (SDG SE66). The metals MS percent recoveries were acceptable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 75 to 125 percent with the following exceptions:

SDG SE67: Matrix spike analysis was performed on Sample JF-T3B3-SO-03 with elevated zinc spike recovery (at 141%). Zinc result for Sample JF-T3B3-SO-03 is qualified as estimated (J).

Laboratory Duplicate Analysis: Laboratory duplicate analysis was performed on selected samples. Duplicate analysis was within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD for both soil and water with the following exceptions:

SDG SE67: Laboratory duplicate was performed on Sample JF-T3B3-SO-03. Copper and zinc RPD values were greater than 20%. Sample JF-T3B3-SO-03 copper and zinc results are qualified as estimated (J) due to poor precision values.

SDG SE82: Laboratory duplicate was performed Sample JF-T1B2-SO-03. The Nickel RPD value was greater than 20%. Nickel results for Sample JF-T1B2-SO-03 as well as its field duplicate (JF-T1B2-SO-03-D) are qualified as estimated (J) due to poor precision values.

Field Duplicate Sample Analysis: Field duplicate results for metals are identified as follows:

- SDG SE67: Field duplicate sample pair (JF-T3B2-S0-13 and JF-T3B2-S0-13-D)
- SDG SE82: Field duplicate sample pair (JF-T1B2-S0-03 and JF-T1B2-S0-03-D)

Field duplicate results are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD for both soil and water (with few exceptions the RPD is calculated when results are greater than five times the reporting level) with the following exceptions:

SDG SE82: On field duplicate sample pair (JF-T1B2-S0-03 and JF-T1B2-S0-03-D), the nickel RPD value was greater than 20%. As discussed above, ARI also performed a laboratory duplicate on Sample JF-T1B2-SO-03 which had an RPD value for nickel of greater than 20%. Nickel results for Sample JF-T1B2-SO-03 as well as its field duplicate (Sample JF-T1B2-SO-03-D) are qualified as estimated (J) due to these poor precision values.

Data Qualifiers

The following qualifiers were used to modify the data quality and usefulness of individual analytical results:

U - The constituent was analyzed for, but was not detected above the reported sample quantitation limit.

J - The constituent was positively identified and detected; however, the concentration reported is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.

UJ – The constituent was not detected; the associated quantitation limit is an estimated value because quality control criteria were not met.

DNR - Do Not Report result(s). Use re-extracted and re-analyzed result(s).

R – Data are rejected due to significant exceedence of quality control criteria. The analyte may or may not be present. Additional sampling and analysis may be required to determine the presence or absence of the constituent. For statistical reasons, rejected values are not included in the database.

Y – The reporting limit is elevated due to interference. The result is not detected.

Data Assessment

Independent review was performed on chemistry data from the analytical laboratory to determine that data are of known and documented quality. Data have been evaluated and based on this information and in my professional judgment, the data are acceptable for use except where indicated by data qualifiers which may modify the usability of the data.

Jessie Compeau

Date: April 6, 2011

Jessie Compeau
Validator
Informa, LLC

Erin Breckel

4/6/11
Date

Erin Breckel;
Acting Quality Assurance Manager
Floyd|Snider

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BOEING COMPANY – JORGENSEN FORGE OUTFALL SITE
SEATTLE, WASHINGTON
Tidal Study Surface Water/Stilling Well Sampling -Winter 2010/2011
DATA VALIDATION QA/QC REVIEW

INTRODUCTION

A total of seven surface water samples were collected December 22, 2010 and January 6, 2011. This sampling was conducted as part of the preparatory work for the property line pipes cleanout action according to the *Source Control Action - 15-inch and 24-inch Pipes Cleanout Work Plan (Floyd|Snider, 2010)*. Samples were analyzed by Analytical Resources Incorporated (ARI) of Tukwila, Washington for the following parameters:

- pH by USEPA Method 150.1
- Alkalinity by SM2320
- Conductivity by USEPA 120.1
- Anions (Chloride and Sulfate) by EPA Method 300.0
- Salinity by SM 2520.B
- Cations (Calcium, Magnesium, Potassium, Sodium) by USEPA Method 6010B

Samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (USEPA SW-846, 3rd edition)* and *Standard Methods (SM) for Examination of Water and Wastewater.*

Samples were analyzed and results reported by the laboratory in batch numbers as summarized below:

SDG SC18 (pH, Alkalinity, Conductivity, Anions, Salinity, and Cations):

JF-PLSD-SW-24A JF-PLSD-SW-37-7 JF-PLSD-SW-Public

JF-PLSD-SW-24B JF-PLSD-SW-37-2 JF-PLSD-SW-Public-D

SDG SJ56 (pH, Alkalinity, Conductivity, Anions, Salinity, and Cations):

LDW-Stilling Well

Quality assurance/quality control (QA/QC) reviews of laboratory data were performed in the laboratory in accordance with the laboratory quality assurance program plan. The data validation QA/QC review focused primarily on laboratory result summary sheets and quality control summary sheets to ensure that work plan data quality objectives were met for the project. Data validation was conducted in accordance with the criteria

outlined in the National Functional Guidelines for Inorganic Data Review (EPA 2004), modified to include method specific requirements of the laboratory analytical methods.

The validation level specified in Work Plan and Appendix B Sampling Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) of the *Source Control Action - 15-inch and 24-inch Pipes Cleanout Work Plan (Floyd|Snider, 2010)* is a Level 1 which is considered a basic review of the analytical data collected during work involving the cleanout of the pipes. Qualified results (referred to in the Work Plan as external data validation qualifiers) were added by the data validator to electronic data deliverables (EDD). The following data requirements were evaluated:

- Package completeness
- Sample identifications and reported analyses match the Chain-of-Custody Form
- Sample holding times and sample preservation
- Verification that the required detection limits and reporting limits have been achieved.
- Verification that the field duplicates, matrix spike/ matrix spike duplicate samples (MS/MSDs), and laboratory control samples were analyzed at the proper frequency.
- Matrix spike recoveries
- Laboratory control sample recoveries
- Laboratory method blanks
- Rinsate blank

CASE NARRATIVE COMMENTS

Review of cover letters, which include case narrative notes, with associated Sample Delivery Groups (SDGs) indicates no anomalies or discrepancies for SDGs SC18 and SD56.

For SDG SC18, ARI reported that the date of analyses for the alkalinity analysis preceded the date of sample collection. ARI was contacted to correct the date of analysis and reissue sample results for alkalinity. A revised report was received from ARI.

SAMPLE CUSTODY, SAMPLE RECEIPT, and PRESERVATION

Chain of custody (COC) record, laboratory analysis request, cooler receipt forms, and other documentation (i.e. preservation verification form) were reviewed. Samples were received by ARI in good condition.

INORGANICS - Metals

The laboratory provided a complete Level 1 data package for the inorganic analysis; the items reviewed during validation are summarized below.

Analytical Methods: For metals analysis, the water samples were prepared using EPA Methods 3010A. Metals analysis was completed by USEPA Methods 6010B, in accordance with the method listed in the SAP/QAPP.

Sample Holding Times: All samples were prepared and analyzed within the recommended holding period from the date of collection; 180 days for metals. All holding time criteria were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010). It should be noted that SAP/QAPP reporting levels are in u µg/L and ARI results are reported in mg/L. No action was taken other than to note this. The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds or interferences. No action was taken.

Blank Contamination: The method blanks were free of target compounds.

Laboratory Control Sample (LCS) Recovery: LCS (blank spike) samples were performed with each analytical batch. All LCS recoveries were acceptable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 75 to 125 percent.

Matrix Spike Analysis: For SDGs SC18 and SD56: Matrix spike analyses were not performed. Refer to field duplicate results for a measure of precision and refer to LCS results for accuracy.

Laboratory Duplicate Analysis: Laboratory duplicate analysis, a measure of precision, was not performed for SDGs SC18 or SD56. Refer to field duplicate results for a measure of precision.

Field Duplicate Sample Analysis: Field duplicate results for metals are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% relative percent difference (RPD) for water samples (field duplicate pair JF-PLSD-SW-Public and JF-PLSD-SW-Public-D).

GENERAL CHEMISTRY

The laboratory provided a complete Level 1 data package for general chemistry analysis; the items reviewed during validation are summarized below.

Analytical Methods: Samples for general chemical parameters were analyzed using the following methodology:

- pH by USEPA Method 150.1
- Alkalinity by SM2320
- Conductivity by USEPA 120.1
- Anions (Chloride and Sulfate) by EPA Method 300.0
- Salinity by SM 2520.B

All samples were analyzed according to methods identified in the approved SAP/QAPP (Floyd|Snider, 2010) with two exceptions:

Salinity measurements were conducted by method SM 2520.B instead of USEPA Method 120.1. No action was taken other than to note that the methods are comparable.

pH measurements were conducted by USEPA Method 150.1 instead of SAP/QAPP listed methods as either USEPA 305.1 or SM2310. No action was taken other than to note that USEPA Method 150.1 can be used to measure pH in surface and saline waters, domestic and industrial wastes and acid rain.

Sample Holding Times: All samples were prepared and analyzed within the recommended holding period from the date of collection; 28 days for anions, salinity, and conductivity; 14 days for alkalinity, and 14 days for pH. It should be noted that ARI analyzed all samples submitted for pH analysis immediately, upon receipt. All holding time criteria were met.

Laboratory Reporting Limits: The laboratory achieved the reporting limits (RLs) required by the approved SAP/QAPP (Floyd|Snider, 2010) with the following discussions:

Units for salinity are expressed as parts per thousand by the laboratory and not µS/cm as stipulated in the SAP/QAPP. No action was taken.

The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds or interferences. No action was taken.

Blank Contamination: The method blanks were free of target compounds.

Laboratory Control Sample Recovery: LCS (blank spike) and Standard Reference Material Samples (SRM) were performed with each analytical batch. All LCS and SRM recoveries (and absolute difference for pH) were acceptable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 75 to 125 percent (absolute difference for pH is acceptable).

Matrix Spike Analysis: Matrix Spike (MS) analysis were not performed. Refer to LCS/SRM and field or laboratory duplicate results for accuracy and precision data.

Laboratory Duplicate Analysis: Laboratory duplicate analysis was performed on selected samples. Duplicate analysis was within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD.

Field Duplicate Sample Analysis: Field duplicate results for conventionals are comparable and within the approved SAP/QAPP (Floyd|Snider, 2010) QC limits of 20% RPD for water samples (field duplicate pair JF-PLSD-SW-Public and JF-PLSD-SW-Public-D).

Data Qualifiers

No qualifiers were applied by the data validator to SDGs SC18 and SD56.

Data Assessment

Independent review was performed on chemistry data from the analytical laboratory to determine that data are of known and documented quality. Data have been evaluated and based on this information and in my professional judgment, the data are acceptable for use except where indicated by data qualifiers which may modify the usability of the data.

Jessie Compeau

Jessie Compeau
Validator
Informa, LLC

March 8, 2011
Date

Erin Breckel

Erin Breckel;
Acting Quality Assurance Manager
Floyd|Snider

3/29/11
Date

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